Vol. V

TRANSCRIPT OF RECORD

Supreme Court of the United States

OCTOBER TERM, ~~1942~~ 1945

No. ~~721~~ /

THE NORTH AMERICAN COMPANY, PETITIONER,

vs.

SECURITIES AND EXCHANGE COMMISSION

ON WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SECOND CIRCUIT

PETITION FOR CERTIORARI FILED FEBRUARY 10, 1943.

CERTIORARI GRANTED MARCH 1, 1943.

United States Circuit Court of Appeals

FOR THE SECOND CIRCUIT

October Term, No. ——

THE NORTH AMERICAN COMPANY,

Petitioner,

v.

SECURITIES AND EXCHANGE COMMISSION,

Respondent.

TRANSCRIPT OF RECORD

TESTIMONY

Volume V

(Pages 1592 to 2043)

ON PETITIONS FOR REVIEW OF ORDERS OF SECURITIES AND EXCHANGE COMMISSION

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Volume V.

4774 BEFORE THE

Securities and Exchange Commission

Docket No. 59-10

IN THE MATTER

of

THE NORTH AMERICAN COMPANY, *et al.*

4775

Hearing Room 1102-A,
Securities and Exchange Commission Building,
Washington, D. C.,
Friday, September 27, 1940.

Met, pursuant to adjournment, at 10:00 o'clock a. m.

Before: W. W. SWIFT, *Trial Examiner.*

4776 Appearances:

S. PEARCE BROWNING, JR., and

CHARLES S. HAMILTON, JR., of Sullivan & Cromwell, 48 Wall Street, New York City, Attorneys for the Respondents.

HERMAN O'DELL,

MISS E. H. CALKINS, and

C. M. MAXWELL, Attorneys on behalf of the Securities and Exchange Commission.

PROCEEDINGS

Mr. Browning: I should like to have marked for identification as Respondents' Exhibit No. 41, a chart entitled, "Wisconsin Electric Power Company, Organization Chart".

The Examiner: All right.

(Chart was marked for Identification as Respondents' Ex. 41.)

Mr. Browning: As Respondents' Exhibit No. 42 for identification, a chart marked, "Organization Chart, Wisconsin 4778
Gas & Electric Company", and as Respondents' Exhibit No. 43 for identification, a chart marked, "Organization Chart, Wisconsin Michigan Power Co."

The Examiner: They may be so marked.

(The two charts described were marked Respondents' Exhibits 42 and 43.)

Whereupon, Gould W. Van Derzee resumed the stand and testified as follows: 4779

Direct Examination by Mr. Browning (Continued):

Q. Mr. Van Derzee, I hand you these three charts which are Respondents' Exhibits Nos. 41, 42 and 43. Were these prepared under your direction and do they correctly set forth the facts shown therein? A. They were, and they do.

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Mr. Browning: I offer these charts in evidence as Respondents' Exhibits 41, 42 and 43, respectively.

Mr. O'Dell: No objection.

The Examiner: They are received in evidence under the numbers respectively assigned them.

(Exhibits 41, 42 and 43 for Identification, received in evidence as described.)

Mr. Browning: I may say further for the record, Mr. Examiner, that I have offered these charts at the request of counsel for the Commission.

The Examiner: Yes, I recall hearing that request
4781 yesterday. Thank you.

By Mr. Browning:

Q. Are there instances of joint operations of personnel or facilities by Wisconsin Michigan Power Company? A. Yes, the executive officers of Wisconsin Michigan Power Company are charged with the general administration and supervision of the electric, gas and transportation divisions of that company. The executive and general office division is located at Appleton where many of the functions common to the gas, electric and transportation services are performed
4782 jointly by the general office employees. Joint use of the facilities provided in the general office naturally materially reduces the overhead costs incident to those operations.

I will give you a few examples of joint operation. The advertising and sales promotional group develops advertising ideas and merchandising policies used to promote the sales of gas and electric service and also merchandise in those groups. An effective but inexpensive method of advertising gas and electric service and also merchandise in

those groups is accomplished by placing advertising car cards in the buses of the Wisconsin Michigan Power Co.

The general accounting division of the company accumulates and summarizes all charges to the various operating accounts, prepares regular and special reports such as the financial and operating report, statistical reports, etc., for the gas, electric and transportation operations. This division also receives all vouchers covering equipment, materials and supplies and services purchased for use by the gas, electric and transportation divisions, verifies the charges and 4784
issues the checks in payment for all such purposes.

The payroll accounting group performs all time-keeping functions, prepares payrolls and payroll distributions, and issues payroll checks for all of the employees engaged in the gas, electric and transportation operations. The employees' records are also kept by this group. The joint performance of payroll operations results in lower costs for the electric, gas and transportation systems in that all duplication of personnel, records and equipment are eliminated.

—2,103—

The centralized typing and stenographic group performs 4785
all typing and stenographic work incident to reports and correspondence and data prepared by all divisions in the general office group.

Telephone and switchboard operaters handle all incoming, outgoing and internal calls for all three divisions of the company, thus effecting some economies that would not be present if each were separate and each had to have a telephone operator and local switchboard.

Employees of the general engineering division are engaged mainly in laying out and preparing working drawings for the

construction and maintenance of the electric distribution and transmission system. They also handle any construction and special projects for the manufacture and distribution of gas. A testing laboratory which is a part of this division makes analyses of coal, which is to be used for both the electric and the gas business. It is not the same coal, however, that is used for the production of steam that is used in the gas business. Separate testing laboratories for analyzing such coal would naturally cost more, both from the stand-
4787 point of labor involved and the necessity for more equipment.

Smoke and dust analyses at both the electric generating plant and the gas production plant are also made by the one chemist who operates the one laboratory.

The general engineering division also does blueprinting and duplicating and lettering for all the utility services. The

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fact that these facilities are used jointly results, we believe, in lower costs.

There is also a greater load factor on the smaller division that does this work than would be possible if there were three
4788 separate divisions doing this work.

We have a property records division. It analyzes all work orders and retirements and distributes the cost of materials and labor to the capital accounts of the gas, electric and transportation systems. This group also maintains the proper records of each of the operating divisions.

The map records of both the gas and electric systems are also maintained in that division. We have a purchasing and storage department in Wisconsin Michigan Power Company at Appleton. Services performed by this division embrace

purchasing and store-keeping operations and are performed for the electric, gas and transportation systems.

Obviously the elimination of dupuicate facilities which would exist if each of these systems performed their functions individually results in a lower cost for each. The delivery of all gas and electric appliances is also handled by this group.

If Mrs. Jones, alongside of Mrs. Smith, wants a gas range, while Mrs. Smith wants an electric toaster, one truck
will accomplish the same delivery. 4790

We have a customers' accounts division in the southern

—2,105—

division of the company and this southern division figures, prepares and proves both gas and electric service and merchandise bills rendered to the customers. This is a joint operation, that is one billing is prepared for each customer, covering both gas and electric service and gas and electric merchandise.

A substantial saving in the cost of preparing customers'
bills is thus effected by this joint process, in that only one 4791
addressograph operation is necessary and only one bill is handled in the machine, billing and proving operation. The collectors interview both gas and electric customers in an attempt to collect delinquent accounts. A saving is effected by this arrangement since it is necessary to have only one interview with the customer.

Tellers located at the various company sales offices accept payment for both gas and electric service and merchandising bills. In addition to the collection work the tellers also receive service applications, disconnection orders

and change of residence orders for both gas and electric service.

The cashier of the company receives and audits all collections for gas and electric services and merchandise accounts made by the tellers and collectors, as well as all fares collected in the transportation business.

—2,106—

We have a merchandise sales division in the southern division of Wisconsin Michigan Power Co. The merchandise
4793 sales force displays, demonstrates and sells both gas and electric equipment and appliances on customers' premises as well as at the company's sales offices. Joint use of these sales facilities results in a saving in the cost of merchandising which would not exist if the gas and electric equipment were sold by separate companies and salesmen.

The merchandise sales division also employs several inspectors and service men whose duties are to inspect periodically and make minor adjustments to both gas and electric appliances purchased by the customers.

In the southern division of Wisconsin Michigan Power
4794 Co., there is an electric distribution department. This department maintains a carpenter shop which is jointly used by the gas and electric utilities and the transportation system. Repair work on transportation business as well as the building and special equipment and repair work for gas and electric utilities is performed in this shop.

Considerable saving results from this joint use of personnel, buildings and equipment. The reading of gas and electric service meters in the communities where both services are available is one of the most evident instances of joint operation being a saving. A substantial saving in the cost

of rendering service bills is effected by this arrangement in that only one trip to the customer's premises is required. Due to the fact that only one bill is issued to the customer for both gas and electric services, a similar saving is effected

—2,107—

in the bill delivering.

We have a power generation department of Wisconsin Michigan Power Co., in the southern division. The plant maintenance men perform all maintenance operations such
as repairing and cleaning mains and other plant equipment 4796
in the gas plant as well as in the electric plant. A machine shop is a part of this division and is used to build special equipment, and to repair equipment for both the electric and gas utilities and transportation system. Again, the elimination of duplicate facilities through joint operations results in lower costs.

The only gas distribution department of the company is that which is in the southern division. No gas is sold in the northern division. The gas meter men in the Neenah district perform electric meter connections and disconnections
as well as gas meter work. This arrangement results in 4797
improved operating efficiency, since it is not necessary to send an electric meter man to this district to take care of the small volume of the daily work.

The gas distribution department operates a blacksmith shop where repair and welding work are performed for the transportation buses in addition to repairing of tools, material, welding and the building of special equipment for gas and electric operations.

We have a transportation department in the southern division. This department maintains a garage where gas

4798 and electric utility vehicles are housed, serviced and re-

—2,108—

paired, as well as the transportation department buses. This joint use results in operating economies in that special facilities for the repair and housing of vehicles of each utility and the transportation department are not necessary.

Bus operators are frequently used to perform work in the general storeroom in a period between rush hours in order to utilize their time instead of paying minimum wages
4799 under the contract which we have to do whether there is certain transportation work or not.

Q. Will you now give us the instances of joint operation by Wisconsin Gas & Electric Company? A. In view of the fact that Wisconsin Gas & Electric Company furnishes utility services in a wide area where there are many small cities and communities, joint operation of two or more services makes possible many economies and better service than would exist if each service were performed separately. Duplicate office space and personnel would definitely increase the cost of each service over present costs.

4800 There are a number of divisions which I will now describe in Wisconsin Gas & Electric Company where there are instances of such joint operation. The officers and executives of Wisconsin Gas & Electric Company form the policies and manage the operations of the entire company which includes the electric, gas and heating utilities and the transportation system.

—2,109—

The background required for management of each utility operation is usually entirely useful in the operation of

another. Thus the management of all utilities of the Wisconsin Gas & Electric Company, by a single management group, makes it possible to administer the affairs of the company in a more efficient and effective manner than would be possible if each of the utility services were carried on by a separate corporation.

It so happens that in a few of the communities served by gas through Wisconsin Gas & Electric Company an associated company, the Wisconsin Electric Power Co., furnishes
electric service. The relation of these two companies has 4802
made it possible to eliminate duplicate office facilities and personnel by having the one company use jointly the facilities of the other.

Whichever company can more economically perform the services of the other is given the work to do.

That relationship just described is more definitely covered by testimony in connection with the joint functions in the city of Racine, where Wisconsin Electric Power Co. does the electric service business and Wisconsin Gas & Electric Company the gas business, and because of the fact that the home
office of the Wisconsin Gas & Electric Company is at Racine 4803
it takes the lead in doing the joint operation for compensation at rates and on a basis previously described.

The general accounting department accumulates and summarizes all charges for various accounts of the gas, electric and heating utility and the transportation system. This

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department assembles data for and prepares various types of reports such as financial and operating reports, statistical reports and reports required by the various government agencies.

The general accounting department receives all vouchers for materials, supplies and services purchased by the various utilities in the transportation department, ascertains the correctness of the charges and issues the checks in payment therefor.

The stores accounting group maintains and posts to the stock record cards all receipts and disbursements of materials, merchandise and supplies for the gas, electric and heating utilities and the transportation department. This
4805 group also prices, extends and obtains the cost of all merchandise, materials and supplies disbursed, prepares the journal entries of material charged to the various accounts, and maintains a running inventory of all materials and supplies which have been purchased for the three groups.

Performance of these joint operations by a single group results in lower costs for each utility and the transportation property than would be the case if these services were performed separately by each utility and by the transportation department. The lower costs are due to the elimination of duplicate personnel, records, equipment and office space.

4806 The pay roll accounting group performs all types of timekeeping and pay roll operations for the electric, gas and heating utilities and the transportation department.

—2,111—

This group also maintains employee record cards, prepares and maintains earning record cards for all employees of the company. In the preparation of pay roll checks an addressograph machine is used which materially reduces the time and cost of performing the work. Inasmuch as this machine is also used for the preparation of gas and electric service bills, the resultant joint use increases the load factor

of the machine and lowers the cost of all addressograph work performed.

The auditing and developing group audits gas, electric, heating and transportation accounts. This group also audits the funds of the cashiers and the transportation station clerks. One of the functions of this group is to develop procedure, relative to customer accounting practices of the gas, electric and heating utilities.

We have a general engineering department of the Wisconsin Gas & Electric Company which is located at Racine. 4808
Services performed by this department cover electric, gas and heating utilities, and the transportation system as their needs arise and embraces such operations as development work on new projects, the preparation of orders covering construction and maintenance work, and formulation and issuance of job specifications relative to gas, electric, heating and transportation work.

This group is also responsible for the standardization of construction of electric and gas mains throughout the company's territory.

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In view of the fact that the performance of this engineering work requires specially trained and experienced personnel, and also in view of the fact that many of the engineering problems relative to the one utility directly affect one or more of the other utilities, it is inconceivable that engineering services could be performed separately by each utility and the transportation department without a great sacrifice in operating economy and efficiency of operation.

Mr. Browning: Read that last sentence back, please.

(Testimony indicated was read back.)

The Witness: The property record group analyzes all work orders and maintains property records for the electric, gas and heating utilities of the transportation system.

The drafting group prepares all sketches and layouts and detailed drawings for construction and maintenance work for the gas, electric and heating utilities

4811 of the transportation division.

The blueprinting and photostatic group makes blueprints of maps, reports and drawings and photostats of letters, legal reports, and records required by the various departments of the company. This joint performance of blueprinting and photostating operations permits of a greater load for the equipment and results in a smaller unit cost of production.

There is a general sales division of Wisconsin Gas & Electric Company located at Racine.

—2,113—

4812 The sales promotion group develops methods of merchandising the several services of the company and sees to it that these methods are properly executed by the salesmen in the sale of gas and electric services.

We also have the purchasing and stores department which is centralized at Racine. The purchasing group performs the purchasing services for the gas, electric and heating utilities and the transportation department. These services embrace the obtaining of price and quantity quotations, preparation of purchase

orders and following the transaction through to completion. Since the efficient performance of purchasing operations requires experienced personnel, it would be a very costly duplication if each utility had to have a separate purchasing department.

The office service division of Wisconsin Gas & Electric Company at Racine types all reports, letters, forms, orders, stencils, and other material for the executive and general office departments located in the general office building. 4814

Since these departments perform joint services for the gas, electric and heating utilities, and the transportation department, it follows that the office service division also performs joint services.

The operation of a centralized typing group is most efficient when the work load factor is maintained at a high level. The fact that this division performs typing work for all departments makes it possible to

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have a reasonably high load factor and to obtain unit 4815
costs that are low.

The addressograph group performs services for the three utilities in the transportation department. These services include addressographing the bi-weekly and monthly pay roll distribution sheets and pay roll checks for all employees of the company.

This group also addressographs the gas, electric and steam bills for all division offices except for West Bend. At that point they have a post card type of billing which uses its own particular type of machine.

The performance of addressograph work for joint utility and transportation offices makes possible the economical use of the expensive addressograph equipment.

The stationery stock group has charge of receiving, storing and disbursing of all forms and stationery supplies for the company.

We have certain division offices. The area served by the company being spread out over so many com-
4817 munities in southern Wisconsin has made it economical to divide the territory into four main divisions. Each division has a manager who is responsible for all utility operations in his territory that are not performed by the central offices.

Later on in my testimony we will tell more in detail about the division offices and the district offices, and describe to you fully just how Mrs. Smith gets

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electric service in a small community.

In this connection it should be understood that
4818 while there is duplication of certain functions in each territory, the following description will deal with the joint operations of the utility in each division.

The stenographers and typists perform services for all utilities in the division in which they are located. The services embrace such operations as typing letters, forms, cutting stencils, filing correspondence, etc.

Customers' accounting division figures bills, proofs and balances service and merchandise accounts for the gas and electric utilities. Where a customer has both gas and electric service the charges for both services

are placed on a single bill. Some advantages which accrue from this joint billing procedure include: only one bill being needed; one addressograph plate necessary; only one bill needs to be addressographed; there is less machine and labor cost per account in billing and the unit cost per account in proving is lower.

When a customer has both gas and electric service the meter reader obtains both gas and electric readings when on the premises. As a customer, you know
that it is very discouraging to have men appear a num- 4820
ber of times from a company on different operations and the more that can be done in one operation and the less visits, the better the customer likes it, so there is a public relations aspect to this problem of meter

—2,116—

reading which I am describing primarily as a joint operation which reduces unit costs.

Similar savings are realized in the delivery of bills, since one bill covers both gas and electric accounts.

The storeroom in the division takes care of the re-
ceiving, storing, handling and disbursing of equip- 4821
ment, materials and supplies for the gas, electric and steam utilities. That applies in the one division where there is the steam utility, and in other divisions where gas and electric alone are supplied you have the benefit of the joint operations naturally applied to the two services.

A great deal of duplication and loss of economy would result if these services were performed separately for each utility. The cashiers in the divisions receive payment for gas and electric services, mer-

chandise and appliances. A saving in labor cost is effected by having the payments for all utilities collected by one group of employees.

The collector interviews customers having both gas and electric service in an attempt to collect delinquent accounts. This collection service, as distinguished from the one just mentioned under cashiers, applies to collectors who go out in the field on delinquent accounts.

4823 A saving is effected by this arrangement since it is necessary to make only one interview to collect both accounts.

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Service applications for service or change of address orders for both gas and electric services are handled by the same people.

In the local offices in the divisions the showrooms display both gas and electric appliances and merchandise. Company salesmen sell both gas and elecrtic service appliances and merchandise which unques-
4824 tionably makes for better merchandising in the smaller communities.

Employees of the division distribution office work in conjunction with the general engineering office in scheduling work to be done, in standardizing methods of construction, and in the installation of all utility services and equipment. The stabilization of employment and higher annual earnings per employee are possible through such an arrangement.

Service to the customer is improved when the trouble men who perform customer service operations

are trained in all types of work. Fewer trucks are required and less time is wasted when a trouble man can be dispatched to take care of either a gas or electric trouble call.

The joint performance of gas and electric service operations makes for better service to the customer and reduces costs to the company in the form of reduced personnel.

In one of the communities, Waukesha, where gas
and electric service is furnished, we have previously 4826
indicated to you in the testimony that downtown
steam service is available. Employees trained in the

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performance of gas operations can readily perform steam heating operations, thus eliminating the necessity of having to maintain a separate group of specially trained employees just for the steam heating work.

In addition to using the steam generated at the
Waukesha power plant for steam heating purposes,
such plant is used to supply steam for the gas holders 4827
during the cold weather, thus eliminating the necessity
for the gas utility to provide a separate source of
water heating.

In the city of Kenosha exists the only transportation division of Wisconsin Gas and Electric Company. In this case linemen who string wires for electric service use the same skills in maintaining the railway overhead and distribution system. This is a trolley bus system, having the duplicate overhead trolley that I described yesterday.

The accounting operations relating to transportation operations are performed with resultant economies to each. The building used for the housing and repairing of transportation vehicles is also used for gas and electric vehicles.

The garage employees repair and maintain vehicles used in the operation of both the electric and the gas utilities and the joint use of storage and repair facilities reduces the amount of property investment
4829 and effects operating economies by eliminating both duplicate facilities and personnel. We are certain that there are important operating economies in all of our companies resulting from three executive officers

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common to each.

There are not only obvious economies but the fact is that the Transport Company, Wisconsin Gas & Electric Company, Wisconsin Michigan Power Co., and Wisconsin Electric Power Company could not afford to pay the real value of the consulting services of
4830 the common officers.

Q. In addition to common general executive officers, the organization charts also show other common officers. I believe that the secretary and treasurer is common to all companies, and that some, if not all, of the assistant secretaries and assistant treasurers are common to all companies. Does that also result in economies? A. That does result in a very definite and entirely obvious economy. I did not include those you have listed because the general executive officers, as we think of them, would not always include such officers.

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Q. Is the problem of obtaining capital an important one in the public utility business? A. It is extremely important. There are few businesses in which the problem of obtaining new money to maintain and extend services is as extensive as in the public utility business. In this field the extension of electric service facilities has been most marked.

In the two decades following 1910 tremendous demands for capital to finance the rapid growth in number of customers were experienced. In the last decade where there has

—2,120— 4832

been a moderate increase in the number of customers the principal need for increased electric service plant has arisen from the expanded use of electric service in all fields of application. Some of this increased use has been due to the introduction of electric service in new fields. Some of it has been due to increased use in old fields, and some of it has resulted from the ability to do things better electrically that have heretofore been performed by other methods and other fuels.

There has been a tendency in recent years towards in- 4833
creased costs in operating equipment. A turbo-generator recently purchased by Wisconsin Electric Power Co., for example, cost us over 45 per cent. more than the identical machine purchased in the year 1930. Similar comparisons can be made with many other items entering into the plant of an electric utility and in the case of increased capital requirement depreciation reserve funds have been entirely inadequate to cover even temporarily the needs for new capital, even though the depreciation has been set up on an entirely adequate basis.

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At best the use of depreciation reserve funds to finance the current growth of the property is only an expedient because some day the property for which these funds are set up will wear out and you will have to have the capital to replace it.

Many problems of financing are peculiar to the utility industry. For example, the investment required in the electric utility is very substantial in relation to the annual rev-

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4835 enues derived from the sale of electricity. About $5.00 of invested capital is needed for every dollar of operating revenue obtained from the customers of the electric utility. This factor, it may be said, is inherent in the business and will always be with us unless some very revolutionary methods are discovered which will cheapen the process of generating electricity from the power in coal and falling water, and particularly change the method of distribution which requires a complete metallic circuit from the terminals of the generator to every electric appliance throughout the whole territory.

4836 Also the utility must hold itself out to serve all customers on demand. It cannot pick and choose if for some reason it is not convenient to get the capital required to make the extension. This means that it is thrown into the financial market for capital many times when the markets are not favorable to the obtaining of capital.

Just compare this situation with that which confronts other types of private industry. A chain store or a department store, for example, may turn over its capital, and does turn it over, many times a year. If it does not wish to carry a certain line of goods it ceases to carry such goods, even

though the customers come frequently and ask for that particular type of article. Extensions of plant can be made solely at the discretion of the management of a department store at times when capital can be obtained on the most

—2,122—

favorable basis.

There is no customer who can go into a department store demanding delivery of certain goods who can force the department store to carry such goods and to effect such delivery if the owner does not want to make delivery of that 4838
type of article.

In this connection it is interesting to note that the electric utility business is the only business in which the product or service is ordered, manufactured and delivered at one and the same instant. If the customer wants toast for his breakfast at his home 50 miles from the power plant, there must be whirling generators at the plant, a continuous metallic circuit underground through the streets and through the rural territory, without a single break from the terminal of the generator to the toaster cord. He snaps the switch of the toaster which is his way of placing an order for the specific delivery 4839
of service. Before the click of the switch has died away the order has been flashed to the generator, the electricity has been manufactured and the toaster coil begins to heat.

The process must be continuous to give satisfaction to the customer. There is no storing of electricity possible for such purposes. The plant must be of size to handle these instantaneous demands, no matter where they come from or their magnitude, and it is in connection with that condition that we find very large demands for capital to finance the huge

investments necessitated by the peak demands and that brings with it these intricate financial problems to make

—2,123—

financing such an important matter in this business as compared with others.

Not the smallest of the problems in the field of utility financing is laying out a long-term financial plan and being able to follow it. In the case of Wisconsin Michigan group we have attempted to outline over a period of years programs
4841 adequate to meet the constant requirements of the companies for new capital.

For example, Wisconsin Electric Power Co., adopted several years ago a plan for financing extensions to the East Wells Street power plant and the Commerce Street power plant. We thought that we had provided adequate capacity to take us well through 1941, but you know what happened. The preparedness program of the Government made it necessary for all of the utilities to give careful consideration to being able to meet all expected demands and some emergency demands that might be necessary in the national defense,
4842 and so there we were with that problem on our hands.

We decided that in the public interest we should order another 80,000-kw. turbine for an extension to the Port Washington plant known as Port Washington No. 2. We did that even though the financial media have not as yet been worked out to carry through the development.

This project would not have been undertaken were it not for the advice and the encouragement of The North American Company which, during a long history of growth of the

—2,124—

Wisconsin Michigan group has, on many occasions, furnished the necessary backing.

Q. Have the companies in the Wisconsin Michigan group had any difficult financing problems over the years? A. The Wisconsin Michigan group and particularly The Milwaukee Electric Railway & Light Company, have had many difficult financial problems down through the years. Obtaining the necessary capital has been a constant struggle as I will show, but we executives in Milwaukee have never had the type of
worry which the public utility executives would ordinarily 4844
have. In effect The North American Company, over the years, has been our financial backer and as a result we have been freer to devote our major attention to other phases of the business.

Our unusual technical achievements can, in part, be attributed to the fact that we have been left so free to concentrate on the operating side of the business.

The financial history of the companies illustrates graphically the progress in the industry. Constant building up and putting inefficient small companies together to make large
efficient coordinated units which can give better service at 4845
lower costs is an example. This growth is not completed.

Before going into the history of finance of these companies, it might be well to get the perspective that comes from looking at the first evidences of service of different types that we had in the Milwaukee area.

—2,125—

I will give you a little description of the first street railway that we had in Milwaukee. It was known as the River and Lake Shore Railway Company. It was the first to provide street railway transportation service in the city of Mil-

waukee. A franchise was granted to this company September 24, 1859 permitting it to construct and operate a street railway upon whatever streets it chose from Walker's Point bridge to the Sisters' Hospital at North Point. That is a distance, I would say, of about two miles.

The Milwaukee Sentinel of May 31, 1860, makes this rather short comment:

> "Yesterday afternoon about five o'clock two cars of our street railway company, drawn by four horses
> 4847 each, started their first trip from Walker's Point bridge to Division Street."

Apparently the horse car business in those days was not very profitable because a history written by one John G. Gregory, makes this comment about the horse car line that we just discussed: It says,

> "Money was scarce and the undertaking did not pay. In 1869 the franchise and all of the rights and property of the company were sold to Issac Elworth, who took up the lines on the east side and relaid them
> 4848 on the west side, on West Water Street, from which in time extensions were constructed to Reed Street on the south and Third Street on the north."

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Although it appears that the River and Lake Shore Railway Company was the first company to operate street railway service in Milwaukee, the following are a few brief comments relative to the Milwaukee City Railway Company:

The company was incorporated on March 28, 1865. The Council, taking its cue from the general feeling of the public,

as it usually does, was ready to grant them permission to pick out their right of way and lay tracks to their heart's content. The company, however, found scanty profit in the transportation business and sold out to Mr. Elworth at the time he purchased the property of the River and Lake Shore Railway Company.

The record shows that both horses and mules were used to draw the cars in this early period. The record further indicates that the West Side Street Railway Company preferred the use of horses, whereas the Cream City Railway 4850
Company preferred the use of mules.

Another type of motive power for cars was steam power and the record shows that in 1875 a steam-operated road called the Forest Home line was built and operated, using a steam engine for motive power.

A few years later, in 1878, this line was purchased by the Cream City Railroad Company which company discontinued the use of steam power and substituted horses.

The first experiment with electrically-operated cars in the city was on The Milwaukee Cable Railway Company line, more commonly known as the Hinsey Line. The first experi- 4851

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ment took place in 1889. This experiment, however, did not prove to be a success.

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The West Side Street Railway Company, more commonly known as the Becker Line, was the first company to equip its cars for electric operation and continue this type of operation.

The first electric car of this company operated on Grand Avenue in Milwaukee in April 1890. Probably no descrip-

tion of the various forms of motive power in the early days of transportation would be complete without another example.

This is an example of duplicate forms of motive power on one car where one form was not so much in the nature of a reserve, actually, as it was in the nature of a psychological experiment.

This peculiar transportation combination, viewed by a horse approaching down the street would seem to be a phe-
4853 nomenon in which a train of cars was drawn by two effortless mules mounted on a flat car, but the more observant person on the sidewalk would see that black smoke was issuing behind the mules and discover that this was a steam engine with two mules in front.

It so happened that as time went on, the effect of weather and rain and seasons began to get in their work on these two stuffed mules, which were placed on the flat car, obviously to prevent the scaring of horses and the subject was taken up very deliberately by the Common Council of the City of Milwaukee and in the year—I think it was in the early '70's,
4854 Common Council proceedings after a very definite controversy showed a resolution which directed the company forth-

—2,129—

with to do one of two things, either remove the mules entirely or get busy and restuff them.

So we see that there is a lot of experimentation, financing losses and amusement in connection with the attempts to meet the whims of the traveling public in the early days.

Q. When did the first electric light company start in Milwaukee? A. Although a number of companies preceded

the Badger Electric Illuminating Company in making application for receiving a franchise from the Milwaukee Common Council, the Badger Company was the first to start operations as an operating utility.

A private plant owned by S. S. Badger was installed in the exposition building, the forerunner of the present Milwaukee Auditorium, and operated one circuit of fifty arc lamps for demonstration and exhibition purposes.

By July 20, 1885, Mr. Badger was ready to expand his venture for on that date the Badger Electric Illuminating 4856
Company was incorporated and on the same day a franchise was requested from the Common Council.

On November 21, 1885, the franchise was obtained and the company immediately began serving commercial customers and street lamps.

The Examiner: Let us have a short recess at this point.

—2,130—

(Whereupon a short recess was taken.)

4857

By Mr. Browning:

Q. When was Wisconsin Electric Power Company incorporated? A. Wisconsin Electric Power Company as presently constituted was incorporated January 29, 1896, under the laws of the State of Wisconsin, as The Milwaukee Electric Railway & Light Company, having succeeded to the property of The Milwaukee Street Railway Company following a foreclosure sale on January 29, 1896, when the property was acquired by a purchasing committee and transferred by it to The Milwaukee Electric Railway & Light Company.

Q. Now, will you tell us briefly about the predecessor companies and systems of Wisconsin Electric Power Company? A. The Milwaukee Street Railway Company was incorporated on December 22, 1890, and purchased at various times between that date and December, 1893, the properties of the following companies located principally within the limits of the City of Milwaukee.

The Milwaukee City Railroad Company, incorporated December 1, 1888, purchased by The Milwaukee Street Rail-
4859 way Company December 22, 1890, was, itself, the successor of The Milwaukee City Railway Company, incorporated March 28, 1865, by special act of the legislature and granted franchise to operate on certain streets of the east, west and south sides of the City of Milwaukee.

—2,131—

The Cream City Railway Company, incorporated April 22, 1890, and purchased by Milwaukee Street Railway Company, February 19, 1891, was the successor of Cream City Railroad Company, incorporated August 18, 1874, which in turn succeeded an association consisting of F. B. Van
4860 Valdenberg, and others who had obtained a fifty-year franchise in 1874 to operate on streets on the west and south sides of Milwaukee.

The deal was negotiated by Henry Villard under contract of June 20, 1890, which contract was assigned to Villard by The North American Company on August 5, 1890.

West Side Railroad Company, incorporated June 5, 1889, was successor to West Side Railway Company incorporated December 17, 1888, which in turn succeeded the West Side Street Railway Company, incorporated July 29, 1875, and

which, likewise, succeeded to an association of J. H. Tesch, John Plinkinton, et al.

The company operated on the west side of the City of Milwaukee. The entire capital stock of West Side Railroad Company amounted to $300,000.00, was purchased by North American Company from Washington Becker on September 29, 1891, and in turn sold by The North American Company to Milwaukee Street Railway Company on November 25, 1893.

The Milwaukee and Whitefish Bay Railway Company incorporated May 24, 1886, was acquired by Milwaukee Street Railway Company of New Jersey, through purchase 4862

—2,132—

of 2,196 shares of capital stock of a total capitalization of 2,400 shares, from Charles Pfister, under contract dated June 1, 1891.

The Milwaukee Electric Street Railway Company, incorporated July 10, 1893, was successor to Milwaukee Electric Railway Company, incorporated December 19, 1889, which in turn succeeded through Mr. Charles Pfister to the Milwaukee Cable Railway Cowpany, incorporated May 26, 1887, 4863
operated on certain streets in the third ward of the city, purchased by Milwaukee Street Railway Company of New Jersey, from Mr. Pfister on June 2, 1894.

The Edison Electric Illuminating Company, incorporated August 20, 1889, was established by the Edison General Electric Company of New York and purchased by The North American Company on January 31, 1890. Property transferred by The North American Company to Milwaukee Street Railway Company for stock and bonds.

The Badger Electric Illuminating Company, incorporated July 20, 1885, was originally purchased by Henry Villard

from J. A. Hinsey on June 18, 1890, the contract subsequently assigned by Mr. Villard to The North American Company on July 7, 1890, sold to Milwaukee Street Railway Company by The North American Company on December 22, 1890.

The property, entire capital stock, and $30,000.00 of bonds of The Milwaukee Electric Light Company were purchased by The North American Company on October 8, 1890

—2,133—

4865 from Charles A. Brown of Chicago.

The company was incorporated in Illinois on June 9, 1889.

In subsequent years, the operations of The Milwaukee Electric Railway & Light Company were expanded through the acquisition by purchase or merger of the properties and businesses of various other public utility companies, the principal amount of which were the Milwaukee Light, Heat & Traction Company, North Milwaukee Light & Power Company, Wells Power Company, and the Milwaukee Northern Railway Company.

4866 The Milwaukee Light, Heat & Traction Company, incorporated December 14, 1896, was purchased by The Milwaukee Electric Railway & Light Company at a cost of $13,240,987.28. The consideration paid by The Milwaukee Electric Railway & Light Company consisted of $1,600,000.00 par value of common stock of The Milwaukee Electric Railway & Light Company, $864,150.20 cash or equivalent in notes and the assumption of the indebtedness of The Milwaukee, Light, Heat & Traction Company, amounting to $10,776,837.08.

The amount of common stock of The Milwaukee Electric Railway & Light Company, issuable to Milwaukee Light, Heat & Traction Company as part of the purchase price, in amount of $1,600,000.00 was reduced to $1,400,000.00 by order of the Railroad Commission of Wisconsin in its order of November 28, 1922, the difference of $200,000.00 eventually being transferred to depreciation reserve.

—2,134—

The Railroad Commission of Wisconsin was the predecessor of the present Public Service Commission of Wisconsin. 4868
Milwaukee Light, Heat & Traction Company had title to the traction, lighting and heating properties serving an extensive territory to the south and west of the City of Milwaukee, the principal communities served being the cities of Racine, Cudahy, South Milwaukee and West Allis and the villages of Shorewood and Whitefish Bay.

Its transportation properties extended to the cities of Racine, Kenosha, Burlington, Waukesha and Watertown and it rendered local transportation service in the City of Racine and in the suburban communities immediately surrounding the City of Milwaukee. It acquired at various times, prop- 4869
erties and businesses of a number of smaller companies, to wit: Pabst Light, Heat & Power Company, incorporated in 1896, was acquired February 15, 1897, for $678,805.61, consisting of cash, bonds, real estate and a mortgage note.

A portion of the property consisting of a power house, lighting distribution system and underground steam heating tunnels was transferred in 1899 to The Milwaukee Electric Railway & Light Company for $300,000.00.

The remaining portion consisted of Wauwatosa Railway and extending from 27th and Walnut Streets in Milwaukee

4870 to Wauwatosa and a power house and lighting system in the town of Wauwatosa.

—2,135—

The Milwaukee and Wauwatosa Motor Company, incorporated October 24, 1888, purchased December 9, 1897, consisted of a steam dummy line, operating from 36th and Wells Street in Milwaukee to Wauwatosa and from 59th and Wells Street to North Greenfield.

The Waukesha Beach Electric Railway comprised five
4871 miles of track from Waukesha to Waukesha Beach, a power plant at Waukesha and some six or seven cars.

This company was incorporated August 27, 1894, and purchased by Milwaukee Light, Heat & Traction Company in 1897.

The Milwaukee, Racine and Kenosha Electric Railway property consisted of thirteen miles of line from South Milwaukee to Racine and ten miles of line from Racine to Kenosha, together with machinery valued at $30,000.00 installed in the power house of Belle City Electric Railway in Racine.

The company was incorporated August 8, 1896, and ac-
4872 quired in 1897 for the sum of $429,308.76. The Belle City Electric Railway property consisted of 13½ miles of street railway system in the City of Racine, a power house and two car houses, all of which were acquired in 1899, through the purchase of outstanding stocks and bonds for $299,120.70.

The company was incorporated July 31, 1897, having succeeded to the property of Belle City Street Railway Company which was incorporated June 1, 1883.

—2,136—

The Badger Electric Company, an electric lighting utility doing business exclusively in Racine, owned a power

house and electric line construction. It was incorporated October 28, 1884 and acquired in 1899 for the sum of $144,586.91.

The Milwaukee and Waukesha Electric Railway Company was acquired largely for its right-of-way between West Allis and Waukesha. The company was incorporated July 31, 1895, as the Milwaukee General Railway Company and the same subsequently changed to Milwaukee and Waukesha Electric Railway Company on June 16, 1896.

It was acquired in 1899 for the sum of $133,000.00. The 4874
South Milwaukee Electric Light & Power Company was incorporated January 13, 1898, and purchased in 1899 for $15,000. Its property consisted of a power plant and lighting system in the City of South Milwaukee.

The Chicago, Waukegan and North Shore and the Chicago, Kenosha and Milwaukee Railways were acquired in 1906 by a stock purchase for the sum of $125,487.38.

The Milwaukee and Wauwatosa Electric Company, incorporated June 8, 1891, and purchased in 1914, was successor to Wauwatosa Electric Company, incorporated March 1,
1889, and The Milwaukee and Wauwatosa Rapid Transit 4875
Company, incorporated January 19, 1891.

(Discussion off the record.)

A. (Continuing) Waukesha Street Railway Company, in-

corporated May 21, 1897, Milwaukee and Muskego Lakes Electric Railway Company, incorporated October 28, 1899, The Waukesha Electric Railway Company, incorporated May 21, 1897, and acquired through an assignment of franchise on December 28, 1897, Watertown-Oconomowoc

Light, Heat & Power Company, incorporated November 17, 1903, Hevi Duty Electric Company was incorporated November 6, 1924.

On November 2, 1925, Milwaukee Light, Heat & Traction Company acquired 1,250 shares, or 50 per cent. of the common stock of this company and again on April 27, 1929, acquired 625 additional shares amounting to 25 per cent. of the common stock.

This company manufactures and sells electric heating
4877 equipment including furnaces and water heaters and was completely described by me yesterday.

Q. Mr. Van Derzee, I don't believe you indicated the date or approximate date when The Milwaukee Electric Railway & Light Company acquired the properties of Milwaukee Light, Heat & Traction Company. I don't know that you have the date. Could you give the approximate date? A. About 1919.

North Milwaukee Light & Power Company was incorporated January 27, 1906. It furnished electric service to the residents of the then city of North Milwaukee which was
4878 annexed to the City of Milwaukee in 1928.

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In 1911, The North American Company acquired 100 per cent. of the common stock of this company which was later acquired by Wisconsin Edison Company on December 31, 1912.

On December 31, 1921, The Milwaukee Electric Railway & Light Company purchased the physical property and assets of North Milwaukee Light & Power Company from Wisconsin Edison Company.

 4879

Wells Power Company was incorporated June 7, 1907. This property consisted of power plant equipment located in a leased building in the City of Milwaukee and of electric and steam heating distribution system serving a limited area in downtown Milwaukee.

In 1913, The North American Company acquired all of the outstanding shares of $100.00 par value common stock of Wells Power Company, amounting to 2,000 shares. Subsequently, in 1914, Wisconsin Edison Company acquired this
stock from The North American Company which was again 4880
transferred to North American Edison Company in 1923 and finally acquired by The Milwaukee Electric Railway & Light Company from North American Edison Company on August 17, 1925, together with Wells Power Company's outstanding 6 per cent. demand notes in principal amount of $225,000.00 for a total consideration of $700,000.00 of preferred stock, 7 per cent. series, issues of 1921, of The Milwaukee Electric Railway & Light Company.

In September, 1926, Wells Power Company was merged into The Milwaukee Electric Railway & Light Company.

—2,139— 4881

Milwaukee Northern Railway Company was incorporated in October, 1905, for the purpose of furnishing transportation service to the area north of the City of Milwaukee and extending to the City of Sheboygan.

The principal communities served were the cities of Sheboygan, Port Washington and Cedarburg. One local railway line was operated in Milwaukee. The capital stock of Milwaukee Northern Railway Company consisting of 10,000 shares of common stock, 6,000 shares of second preferred

stock and 4,000 shares of first preferred stock was purchased by The Milwaukee Electric Railway & Light Company in 1922, and 1924.

In April, 1928, the Milwaukee Northern Railway Company was merged into The Milwaukee Electric Railway & Light Company.

The New Butler Electric Light Company was incorporated in February, 1915, and furnished electric service in the small village of New Butler, a small distance to the north
4883 and west of Milwaukee.

This property was acquired in April, 1920, for a consideration of $18,750.00.

Dousman Electric Light & Power Company furnished electric light and power service to the small village of Dousman located in the town of Ottawa in Waukesha County. The date of incorporation is not known. This property was purchased in January, 1923, from L. J. Bischel of Dousman for a cash consideration of $18,500.00.

—2,140—

Honey Creek Electric Light Company was incorporated
4884 in October, 1914, to furnish electric light and power service to the residents of the small unincorporated community of Honey Creek, the town of Spring Prairie, Walworth County. This property was acquired in August, 1923, from the Honey Creek Electric Light Company for a cash consideration of $3,500.00.

The utility properties of Commonwealth Power Company, Akley Land Company and Continental Realty Company were purchased in one transaction in April, 1917.

These properties, incorporated January 13, 1908, were known as Commonwealth Power Company.

 4885

The Milwaukee Electric Railway & Light Company and Wisconsin Edison Company entered into an agreement on January 31, 1917, with the Uihlein family to purchase the entire common stock and property of Commonwealth Power Company for a consideration of $550,000.00 in cash and $1,450,000.00 in ten-year 5 per cent. serial notes of The Milwaukee Electric Railway & Light Company.

The purchase price was borne jointly by The Milwaukee Electric Railway & Light Company and Wisconsin Edison Company, although the property was deeded to The Mil- 4886
waukee Electric Railway & Light Company.

The Akley Land Company property acquired, consisted of an electric generating station, including land, structure and

—2,141—

equipment.

The property of Continental Realty Company consisted of a boiler plant and generating equipment located in downtown Milwaukee and of tunnels and steam distribution mains and services.

The property of Commonwealth Power Company con-
sisted entirely of transmission and distribution property in 4887
downtown Milwaukee.

Central Heating Company of Milwaukee, incorporated May 17, 1912, and successor to Milwaukee Central Heating Company, incorporated in 1905, was owned by The North American Company, which held 1,000 shares or 100 per cent. of its common stock. On December 31, 1912, North American Company sold this entire stock to The Milwaukee Railway & Light Company and the property and assets of Central Heating Company of Milwaukee were merged with The Milwaukee Electric Railway & Light Company as of that date.

Property acquired consisted entirely of tunnels, mains, services, meters, and so forth, devoted to steam heating service.

Milwaukee Arc Light Company, incorporated November 18, 1893, was purchased by The Milwaukee Electric Railway & Light Company in 1897 at a cost of $107,783.32.

Milwaukee Power & Light Company, incorporated February 10, 1891, a successor to Milwaukee Lighting & Power Company, which was incorporated April 24, 1890.

4889 —2,142—

Plankinton Electric Light and Power Company was incorporated May 29, 1915, and the property purchased as of the same date, payments being spread over a period of twenty years.

The Milwaukee Electric Railway & Light Company purchased the physical property of Port Washington Municipal Electric Utility, consisting of a small steam generating station and electric distribution system serving the City of Port Washington in February, 1930.

Q. Do you recall offhand the capacity of that Port Wash-
4890 ington Municipal Plant? A. Just a few hundred kilowatts. That is the one that was operated by engineer Shaver, who has now become the chief engineer of the Port Washington Power Plant owned by the Electric Company.

Q. And what is the capacity of Port Washington, then? A. 80,000 kilowatts installed with 80,000 coming up.

Wisconsin General Railway was incorporated July 3, 1912. In December 1912, 40 per cent. of the outstanding common stock of this company was acquired by Wisconsin Edison Company. This stock was acquired from Wisconsin

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Edison Company by The Milwaukee Electric Railway & Light Company in January, 1917, which subsequently acquired the remaining 60 per cent. of the common stock in October, 1920.

The company operates, as described yesterday, as a real

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estate holding company.

In October, 1938, The Milwaukee Electric Railway & Light Company merged into itself, the former Wisconsin Electric Power Company, assumed the name of that com- 4892
pany and transferred to The Milwaukee Electric Railway & Transport Company, a new wholly owned subsidiary, its transportation business and properties, except for certain outlying interurban lines leased and operated by The Milwaukee Electric Railway & Transport Company.

The former Wisconsin Electric Power Company was the owner of the Lakeside generating station which it leased to the company and did no other business.

Q. Have you made a computation to determine how many predecessor companies or systems are represented by the present Wisconsin Electric Power Company and on the 4893
transit side by The Milwaukee Electric Railway & Transport Company? A. Yes. The companies which you just named represent the putting together of fifty original companies and systems.

Mr. Browning: Will you mark that chart for identification?

The Examiner: 44 is the number.

(The chart referred to was marked for identification as Respondents' Exhibit No. 44.)

By Mr. Browning:

Q. Mr. Van Derzee, was this chart, Respondents' Exhibit

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for identification No. 44, prepared under your supervision? A. It was.

Q. The data thereon is taken from the records of the company? A. It was.

Mr. Browning: I offer this chart in evidence as
4895 Respondents' Exhibit No. 44.

Mr. Browning: In connection with this chart, Mr.

Mr. O'Dell: No objection.

The Examiner: It is admitted into evidence under the number mentioned.

(The chart referred to was received in evidence as Respondents' Exhibit No. 44.)

Examiner, I may say that it was originally prepared simply to enable a count to be made of the predecessor companies and systems rather than with the purpose
4896 of ever offering the chart in evidence.

It shows, however, so graphically that The North American Company started corporate simplification in 1890, that I think it is a valuable exhibit.

(Discussion off the record.)

By Mr. Browning:

Q. Mr. Van Derzee, the chart bears the heading Wisconsin Electric Power Company, but the transit properties represented in these companies are now held by The Mil-

 4897

waukee Electric Railway & Transport Company? A. That
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is a fact.

Mr. Browning: Will you please mark this chart, which consists of four sheets, bearing the title, "Wisconsin Electric Power Company (formerly The Milwaukee Electric Railway & Light Company)" as Respondents' Exhibit for identification?

The Examiner: Number 45. 4898

(The chart referred to was marked for identification as Respondents' Exhibit No. 45.)

By Mr. Browning:

Q. Was this chart prepared under your supervision, Mr. Van Derzee? A. It was.

Q. Information shown thereon was taken from the books and records of the Company? A. It was.

Mr. Browning: I offer this in evidence as Respondents' Exhibit No. 45.

(Discussion off the record.) 4899

Mr. O'Dell: No objection.

The Examiner: Very well. This exhibit, consisting of four sheets, is admitted in evidence under the number mentioned.

(The chart referred to was received in evidence as Respondents' Exhibit No. 45.)

Mr. Browning: The purpose of this exhibit, Mr. Examiner, is to show in as condensed form as possible,
—2,146—

the financial history of the Company. I think the exhibit more or less speaks for itself, but I would like to ask Mr. Van Derzee if he has any comments with regard to it.

The Witness: Do all copies of this exhibit have numbers designating whether they are sheets, 1, 2, 3 or 4, of this exhibit?

The Examiner: Off the record.

(Discussion off the record.)

4901

The Witness: Sheet 1 of this exhibit, which covers the outstanding securities by classes, as at December 31, 1896 to 1939, inclusive, and as at June 30, 1940, is of interest in that it shows that the total outstanding securities have increased tremendously from 1896, where there were $14,000,000.00 to $112,869,880.00 in 1940.

It also shows some stormy periods of financing, because we note that right after the period of the first World War, up to the beginning of the last
4902 decade, the number of outstanding issues increased quite rapidly, as difficulties of financing were incurred, and then we see evidences of the company getting on top of the situation and gradually reducing the number of issues down to five as of June 30, 1940, compared with a peak of twelve in 1921.

By Mr. Browning:

Q. Have you any comments on the second sheet of the ex-

hibit? A. The second sheet of the exhibit relates exclusively

to the bonds outstanding as of December 31, 1896, to 1939, inclusive and as at June 30, 1940.

One of the interesting figures is the issue of $4,950,000 of refunding and first mortgage bonds. These were issued in 1921 and were out only during that year and it was necessary to have a coupon rate of 7½ per cent. and to sell them at a discount.

That was one of the stormy periods referred to, when money was very expensive, and that compares with the present issue of mortgage bonds outstanding having a coupon 4904
rate of 3½ per cent. which sold at a substantial premium.

It indicates progress of the company, improvement in its affairs, as well as the condition of the money market.

Q. Have you any idea where the 3½'s are selling today? A. Approximately 108.

Q. Have you any comments on the third sheet of the exhibit? A. The third sheet of the exhibit is devoted exclusively to history corresponding to the ones previously given on sheets one and two except that it relates to notes outstanding in the period.

Probably the most important item, as indicative of what 4905
the company had to go through to finance itself in the period

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following the first World War, is the column in which are shown amounts of ten-year 8 per cent. equipment trust certificates due in 1930.

This means that the company, in effect, had to put up its equipment in order to get money. Compare that with the present outstanding unsecured promissory notes due serially in 1948, amounting to $13,250,000.00 outstanding on June 30, 1940, and bearing an interest rate of 2⅝ per cent.

4906 *Gould W. Van Derzee—By Respondents—Direct*

Sheet No. 4 covers the outstanding capital stock for the same period previously described, shows how this has increased from 1896 in the amount of $7,000,000.00 at the time of the first large consolidation, to $44,619,880.00 at the present time.

This sheet covers both common stock and preferred stock. The most interesting item is that of the 8 per cent. series. This was 8 per cent. preferred stock sold at par, as it must be, not less than par in the State of Wisconsin, and that
4907 compares with the rate of 4¾ per cent. on the series now outstanding.

(Discussion off the record.)

By Mr. Browning:

Q. Sheets 1 and 4 show a reduction in the par value of the common stock from $21,000,000.00 on December 31, 1939 to $13,959,280.00 on June 30, 1940. Was this accompanied by the creation of a surplus? A. It was. The reduction occurred in connection with the refinancing of the outstanding 6 per cent. preferred stock issue of 1921 of the company at

4908 —2,149—

which time the par value of the common stock was reduced from $20.00 to $10.00 and a capital surplus created incident thereto.

At the same time, The North American Company exchanged 20,000 shares of 6 per cent. preferred stock, issue of 1921, which it owned, for 120,000 shares of the new common stock which also had the effect of contributing to the capital surplus.

Q. These sheets, embraced within Respondents' Exhibit 45, merely give the par value of the common stock and do

not give any figures with regard to surplus? A. That is true.

Mr. Browning: I have finished with this exhibit, Mr. Examiner, and it is now almost 12:30. I think this would be a good time to recess.

The Examiner: Off the record.

(Discussion off the record.)

Mr. Browning: What is the last?

4910

(Whereupon, the last above recorded was read by the reporter.)

Mr. Browning: I move an adjournment until Monday morning at 10:00 a. m.

Mr. O'Dell: As far as Commission counsel is concerned, we would prefer to continue on this afternoon, but we will not object to Mr. Browning's motion for a continuance at this time.

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The Examiner: I think, Mr. Browning, as he has been here all week, should be allowed to return to his 4911
office and family for the week-end and we will recess at this point until Monday morning at 10:00 o'clock.

(Whereupon, at 12:30 o'clock a. m., the hearing was adjourned until 10:00 o'clock a. m., Monday, September 30, 1940.)

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4912 BEFORE THE

Securities and Exchange Commission

Docket No. 59-10

IN THE MATTER

of

THE NORTH AMERICAN COMPANY, *et al.*

4913

Hearing Room 1101,
Securities and Exchange Commission Building,
Washington, D. C.,
Monday, September 30, 1940.

Met, pursuant to adjournment, at 10:00 o'clock a. m.

4914 Before: W. W. SWIFT, *Trial Examiner.*

Appearances:

S. PEARCE BROWNING, JR., and CHARLES S. HAMILTON, JR., of Sullivan & Cromwell, 48 Wall Street, New York City, Attorneys for the Respondents.

RALPH C. BINFORD, HERMAN O'DELL, and MISS E. H. CALKINS, Attorneys on behalf of the Securities and Exchange Commission.

 4915

PROCEEDINGS

The Examiner: The hearing will come to order.

Mr. Hamilton: Mr. Examiner, I suggest at this time that we bring up to date corrections on the record.

In order to make the corrections without disagreement as to form, I suggest that the stenographer be given a typewritten list of corrections which she can transcribe into the record and that in the original copy of the transcript, which is part of the docket in this case, the corrections be recorded with a cross-reference to the page in the transcript in which 4916
the particular change appears as part of the memorandum of corrections.

Mr. Binford: As I understand it, you propose that in the original docket the corrections be made in pencil but that the errata sheets showing these corrections which will be controlling, be separately incorporated in the transcript.

Mr. Hamilton: That is right.

Mr. Binford: I have no objection to that, Mr. Examiner.

The Examiner: Very well. I think that is a very good arrangement. The stipulation that you gentlemen have just stated will be followed. 4917

Now, I imagine it would take the rest of the morning for you to work on these corrections, will it not?

Mr. Hamilton: Yes, I believe it will.

The Examiner: Very well. We will take a recess at this point until two o'clock this afternoon and the corrections

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that are agreed upon will be incorporated in the minutes of this morning's session.

(Whereupon, the hearing was recessed at 10:15 o'clock a. m., to reconvene at 2:00 p. m. the same day.)

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4918

AFTERNOON SESSION

(Whereupon, at 2:00 o'clock p. m., the hearing reconvened.)

The Examiner: The hearing will be resumed.

Mr. Browning: The Examiner will recall that in the course of the testimony at the last hearing, it was shown that the present Wisconsin Electric Power
4919 Company and The Milwaukee Electric Railway & Transport Company, together, represent the putting together of fifty original companies or systems and that I pointed out at that time that the process of simplification had been developed by The North American Company beginning in 1890.

In that connection and because I think it is of real interest, I would like to refer to the opinion of Judge Seaman in The Milwaukee Electric Railway & Light Company versus the City of Milwaukee, 87 Federal 577.

4920 Mr. Binford: Mr. Examiner, I object to any argument on the part of counsel at this time. I can see that no purpose has been stated for making this statement. Counsel has proceeded with this statement and made the citation of the case and I object to any further statement by him unless the purpose of such statement is first stated.

Mr. Browning: My purpose was not argument, Mr. Examiner, but merely to refer to this decision in which Judge Seaman discussed the putting together of these

companies at this early period, and the resulting advantage to the public.

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Mr. Binford: I move that the last statement of counsel as to the contents of Judge Seaman's opinion be stricken from the record as improper at this time.

If the case in question is deemed a part of the factual material to be considered in this case, the opinion, itself, might be offered in evidence, at which time it could be examined and such objections as 4922
might be proper, if any, be made to it.

Mr. Browning: I take it that it is unnecessary to offer opinions of Federal Courts in evidence in this proceeding.

Mr. Binford: Mr. Examiner, I take it it is also unnecessary to make statements which are self-serving as to what those opinions hold in the course of taking factual testimony before a trial examiner.

The Examiner: Well, is there any doubt or any controversy between you gentlemen that the opinions need not be introduced in evidence of Federal Courts. 4923
Can't they be judicially noticed?

Mr. Binford: I don't think the question of whether any such controversy exists between us is in issue at this moment and I object to the remarks along the lines that have just been made by counsel for the Respondents and I move that they be stricken from the record as highly prejudicial. If there is a proper way, that isn't it.

Mr. Browning: Mr. Examiner, there is no reason for any controversy. All I wanted to do was to get

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into the record for convenient reference, this particular description.

The Examiner: Well, I will overrule the motion to strike.

Mr. Binford: Exception, please.

The Examiner: All right.

Mr. Browning: Off the record.

(Discussion off the record.)

4925 Whereupon GOULD W. VAN DERZEE resumed the stand and testified further as follows:

Direct Examination by Mr. Browning (Continued):

Q. Turning now to Wisconsin Gas & Electric Company, will you outline briefly for us the history of that company? A. Wisconsin Gas & Electric Company was incorporated in the State of Wisconsin on June 5, 1866, as The Racine Gas Light Company.

This company was the successor to the property and business of Racine Gas, Light & Coke Company, which was in-
4926 corporated February 24, 1855.

An earlier company, incorporated in Wisconsin, April 2, 1853, and known as Racine Gas, Light Company, is not believed to have either owned or operated any facilities for the production or distribution of gas.

Gas utility service was first supplied by Racine Gas, Light

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& Coke Company in the year 1855, in the City of Racine, Wisconsin.

In 1877, Racine Gas Light Company acquired through purchase, the operating property of Racine Peoples Gas

 4927

Company, which had been incorporated in the year 1870. Prior to 1912, the property of Racine Gas Light Company was limited to a gas manufacturing plant and a distribution system serving in and about the City of Racine and Racine County, Wisconsin, and a gas transmission line connecting the gas plant in the City of Racine with the gas distribution system in the Kenosha County, Wisconsin.

September 23, 1912, the name of Racine Gas Light Company was changed to the present name of the corporation, Wisconsin Gas & Electric Company, pursuant to authority 4928
granted by the Railroad Commission of Wisconsin; Wisconsin Gas & Electric Company, on October 4, 1912, acquired the assets of the Kenosha Gas & Electric Company on October 7, 1912, acquired the assets of Kenosha Electric Railway Company,

The Kenosha Gas & Electric Company was incorporated in Wisconsin on May 26, 1900. and had as predecessor companies, Kenosha Light & Power Company, incorporated December 16, 1895; the Kenosha Electric Light Company, incorporated June 22, 1893; Electric Illuminating Company,
4929 incorporated in Illinois July 29, 1899; The Kenosha Gas, Electric Light & Fuel Company, incorporated October 22, 1888; Citizen Gas, Light & Coke Company of Kenosha, in-

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corporated May 11, 1877; and Kenosha Gas, Light & Coke Company, incorporated March 28, 1856.

At the time of its acquisition by Wisconsin Gas & Electric Company, the Kenosha Gas & Electric Company operated electric and gas utilities serving in and about the City of Kenosha, Kenosha County, Wisconsin.

4930 *Gould W. Van Derzee—By Respondents—Direct*

Kenosha Electric Railway Company was incorporated April 30, 1902. At the time of its acquisition by Wisconsin Gas & Electric Company, it operated an electric street railway system in the City of Kenosha and rendered electric service to a comparatively few customers in the city.

On July 14, 1915, Wisconsin Gas & Electric Company acquired a transmission line located in Jefferson County, Wisconsin, and connecting the cities of Watertown, Jefferson, Lake Mills and Fort Atkinson, and the village of Johnson
4931 son Creek.

On July 26, 1915, Wisconsin Gas & Electric Company acquired the property of both Watertown Gas & Electric Company, and the Burlington Electric Light & Power Company. The Watertown Gas & Electric Company was incorporated April 27, 1905, and had as predecessor companies, Watertown Gas Company, incorporated May 22, 1862; Watertown Electric Company, incorporated in August, 1902; Watertown Electric Light Company, incorporated June 14, 1889; and Watertown City Gas Light Company, incorporated March 24, 1855.

4932 At the time of acquisition by Wisconsin Gas & Electric

Company, Watertown Gas & Electric Company rendered both electric and gas utility service in and about the City of Watertown located in Jefferson and Dodge Counties, Wisconsin.

Burlington Electric Light & Power Company was incorporated March 23, 1903. At the time of its acquisition by Wisconsin Gas & Electric Company, it rendered utility service in the city and town of Burlington, Racine County, Wisconsin.

On February 9, 1916, Wisconsin Gas & Electric Company acquired the property of the Menomonee Falls Electric Company. This company was incorporated August 1, 1907, and operated an electric distribution system in the vicinity of the village of Menomonee Falls, Waukesha County, Wisconsin.

On August 9, 1916, Wisconsin Gas & Electric Company acquired a small distribution system in the unincorporated village of Clyman, in the Town of Clyman, Dodge County, Wisconsin. 4934

On October 18, 1916, Wisconsin Gas & Electric Company acquired by purchase a small electric distribution system operated in the unincorporated community of New Lebanon, the town of New Lebanon, Dodge County, Wisconsin.

On October 25, 1916, Wisconsin Gas & Electric Company acquired by purchase the property of Campbellsport Electric Light & Power Company. This company was incorporated June 27, 1908, and operated a small electric generating plant and a distribution system which served in and about the village of Campbellsport, Fond du Lac County, Wisconsin. 4935

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On January 13, 1917, Wisconsin Gas & Electric Company acquired by purchase the electric distribution system of the Jackson Electric Light & Power Company located in the village of Jackson, Washington County, Wisconsin.

The Jackson Electric Light & Power Company was incorporated September 18, 1916, and continued the electric business of the Froelich Mercantile Company, which is believed to have first rendered electric service in 1914 in the village of Jackson.

4936

On August 30 and 31, 1917, Wisconsin Gas & Electric Company acquired by purchase a number of electric systems, including Theresa Electric Light & Power Company; Lomira Electric Light & Power Company; Resseville Heat, Light & Power Company; Iron Ridge Electric Light & Power Company; an electric system in the village of Ashippun, Dodge County; Marshall Electric Light & Power Company; Thiensville Electric Light & Power Company; Eden Electric Light Company; an electric system in the village of South
4937 Germantown, Washington County; an electric system in the city of Bristol, Kenosha County; and an electric system in the village of Union Grove, Racine County.

Theresa Electric Light & Power Company was incorporated May 15, 1912, and began rendering electric service in September of the same year.

At the time of its acquisition by Wisconsin Gas & Electric Company, it served in the village of Theresa, and operated a transmission line between the village of Theresa and the City of Mayville, Dodge County.

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4938 In addition to the acquisition of Theresa Electric Light & Power Company, there was also acquired the electric system of Allenton Electric Company, located in the unincorporated community of Allentown, the town of Addison, Washington County, Wisconsin, Lomira Electric Light & Power Company, was incorporated March 6, 1911, and first rendered service in October of the same year. Its property included an electric system serving in and about the village of Lomira, Dodge County, Wisconsin.

Reeseville Heat, Light & Power Company was incorporated November 12, 1915, first rendering electric service in March, 1916, in and about the village of Reeseville.

Marshall Electric Light & Power Company was incorporated December 23, 1915, and first rendered electric service in the village of Marshall in November, 1916.

Thiensville Electric Light & Power Company was incorporated June 11, 1912, and served in and about the village of Thiensville, Ozaukee County, Wisconsin.

Eden Electric Light Company was incorporated Feb- 4940
ruary 20, 1913, and served in the village of Eden, Fond du Lac County, Wisconsin.

Iron Ridge Electric Light & Power Company was incorporated August 23, 1913, and at the time of its acquisition was rendering electric service in the village of Iron Ridge, and in the town of Hubbard, Dodge County, Wisconsin.

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On June 23, 1920, Wisconsin Gas & Electric Company acquired by purchase an electric system of the Grafton Light,
Heat & Power Company. This company was incorporated 4941
October 14, 1910 and furnished electric service in and about the village of Grafton, Wisconsin.

November 22, 1921, Wisconsin Gas & Electric Company acquired a small electric system of the Koshkonong Light & Power Company which served the towns of Koshkonong and Summer both located in Jefferson County, Wisconsin. Koshkonong Light & Pewer Company was incorporated November 19, 1919.

On September 20, 1922, Wisconsin Gas & Electric Company acquired by purchase the electric distribution system,

Bark River Electric Light & Power Company, located in both the village and town of Sullivan, and in the unincorporated village of Rome, all in Jefferson County, Wisconsin.

On December 23, 1922, Wisconsin Gas & Electric Company acquired a small distribution line operated by Lowell Light & Power Company. This company was incorporated November 1, 1915, and served in both the village and town of Lowell, Dodge County, Wisconsin.

On June 2, 1923, Wisconsin Gas & Electric Company ac-
4943 quired the property of Waukesha Gas & Electric Company. Waukesha Gas & Electric Company was incorporated May 2, 1903, as a successor to both the Waukesha American Gas Company, which was incorporated April 21, 1886, and Waukesha Electric Light Company, which was incorporated June

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7, 1886.

At the time of its acquisition by Wisconsin Gas & Electric Company, Waukesha Gas & Electric Company rendered electric and gas service in the city and town of Waukesha, Waukesha County, Wisconsin.

4944 On June 30, 1924, Wisconsin Gas & Electric Company acquired the distribution system of Whitewater Electric Light Company, which was located in the city and town of Whitewater, and the town of Cold Springs, Walworth County. This company was incorporated December 14, 1886, and is believed to have first rendered electric service in 1887.

On April 2, 1926, Wisconsin Gas & Electric Company acquired a small electric distribution system operated by Woodland Light & Power Company, and located in the unincorporated village of Woodland, and in the towns of Hub-

 4945

bard, Herman, and Rubicon, all in Dodge County, Wisconsin.

Woodland Light & Power Company was incorporated May 2, 1916, and first rendered electric service in October, 1916.

On July 24, 1926, Wisconsin Gas & Electric Company acquired the Ornamental Street Lighting System in the city of Waukesha, Waukesha County, Wisconsin.

On September 20, 1926, part of the electric system of the Cary Electric Light & Power Company, located in the unincorporated villages of Salem, Wilmot, and Silver Lake, town 4946
of Salem, and in the town of Randall, all in Kenosha County, Wisconsin, was acquired by Wisconsin Gas & Electric Com-

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pany. Cary Electric Light & Milling Company was incorporated February 16, 1926, but its electric business is known to have been carried on some time prior to this date.

On December 1, 1926, the Wisconsin Gas & Electric Company acquired the gas and electric utility systems in the city of Fort Atkinson. The gas and electric utility systems acquired were operated by the Fort Atkinson Water, Light & Gas Commission, and served in both the city of Fort Atkin- 4947
son and part of the time Koshkonong, Jefferson County. The electric system is believed to have been acquired by the city of Fort Atkinson in 1901 from the Fort Atkinson Electric Light & Power Company which was incorporated July 22, 1890.

The gas utility was acquired in 1920 from the Fort Atkinson Gas Company which had been incorporated January 23, 1909.

On December 30, 1927, Wisconsin Gas & Electric Company acquired by purchase the electric utility properties of

the Helenville Light & Power Company, and the Lafayette Light & Power Company.

The Helenville Light & Power Company was incorporated June 6, 1918, and served in the Village of Helenville, Jefferson County.

Lafayette Light & Power Company was incorporated November 24, 1920, and operated a small electric utility system serving the town of Lafayette, Walworth County.

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4949 On January 3, 1928, having first acquired the capital stock of that company, Wisconsin Gas & Electric Company merged into itself the Badger Public Service Company. Badger Public Service Company was incorporated April 5, 1915, as Elkhart Lake Light & Power Company, which company was successor to Milwaukee and Fox River Valley Railroad Company which was incorporated November 12, 1906.

Badger Public Service Company had acquired, prior to the merger, the electric utility properties of the Cleveland Light & Power Company, which was incorporated February 17, 1913; Oostburg Light, Heat & Power Company, which was
4950 incorporated March 4, 1916; The Malone Light & Power Company, which was incorporated May 27, 1919, and the Kewaskun Electric Light Company, which was incorporated January 17, 1920.

At the date of its merger with Wisconsin Gas & Electric Company, Badger Public Service Company rendered electric service generally in the counties of Sheboygan, Ozaukee, Fond du Lac, and Washington.

In March, 1928, Wisconsin Gas & Electric Company acquired by purchase a small electric distribution system of

Newville Electric Company. This company was incorporated on January 4, 1926, and was operated as an electric distribution system in the town of Lake Mills, Jefferson County.

On June 6, 1928, Wisconsin Gas & Electric Company acquired the electric distribution system of the Cascade Electric Service Company, serving the village of Cascade

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and the town of Lyndon, Sheboygan County.

The Cascade Electric Company was incorporated May 8,
1916. In June, 1929, Wisconsin Gas & Electric Company 4952
acquired the electric distribution system of the Hartford-Rubicon Electric Company, located in the town of Rubicon, Dodge County, and the town of Hartford, and also an electric distribution system in the village of Neosho, Dodge County, Wisconsin.

The Hartford-Rubicon Electric Company was incorporated May 5, 1920.

On January 29, 1932, Wisconsin Gas & Electric Company acquired the electric and heating utility property of Wisconsin Public Utility Company. Wisconsin Public Utility
Company was incorporated on July 16, 1925. 4953

Following its incorporation, this company acquired the property of West Bend Heating & Lighting Company, which company was incorporated August 16, 1907. At the time of its acquisition by Wisconsin Gas & Electric Company, Wisconsin Public Utility Company operated a steam heating utility in the city of West Bend, Washington County, Wisconsin, and an electric utility system serving in the city of West Bend, and any number of communities in rural areas in Washington, Sheboygan, Ozaukee and Fond du Lac Counties.

On November 4, 1936, Wisconsin Gas & Electric Company acquired the electric distribution system of Milford Electric Company, located in the town of Milford, Jefferson

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County, Wisconsin.

Milford Electric Company was incorporated April 9, 1920, although the electric system operated by it is believed to have been in operation sometime prior to that date.

4955 Q. What is the total of original companies or systems which are today represented by Wisconsin Gas & Electric Company, that is of which it is the successor?

Mr. Binford: Objected to until the question is clarified so as to ask in effect what are the companies, the properties of which have been assimilated or acquired, or in lieu thereof, what are the companies, the corporate structure of which, or the securities of which have been taken over or otherwise acquired by the subject company.

4956 As the question is framed, the answer would necessarily be ambiguous. The question is ambiguous.

Mr. Browning: Mr. Examiner, I am really trying to ask a very simple question. The witness has given a description in some detail of the original companies or systems of which Wisconsin Gas & Electric Company is successor. I was merely asking if he had made a total so that he could give us a figure. The reason that I referred to original companies or systems is that in a number of cases there was an electric property which was not incorporated and I think the witness understands that I am talking about original organizations,

incorporated or unincorporated, which were in the
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utility business.

Mr. Binford: The word "successors" is a word of very indefinite meaning. I still insist upon my original objection.

The Examiner: Let's read the question that was objected to.

(Whereupon, the pending question was read by the reporter.) 4958

(Discussion off the record.)

Mr. Browning: Will you please mark this chart entitled "Wisconsin Gas & Electric Company" as Respondents' Exhibit No. 46 for identification?

(The chart referred to was marked for identification as Respondents' Exhibit No. 46.)

By Mr. Browning:

Q. Was this chart, Respondents' Exhibit 46 for identifica- 4959
tion, made up under your direction, Mr. Van Derzee? A. It was.

Q. And does it correctly set forth the facts shown therein, taken from the books and records of the company? A. It does.

Mr. Browning: I offer this exhibit in evidence as Respondents' Exhibit 46.

Mr. Binford: I would like to ask a question or two before deciding whether I have any objection to this or not.

4960 *Colloquy*

Now, this chart, Mr. Van Derzee, consists of three parallel columns, Wisconsin Gas & Electric Company being the only company set forth in the first column.

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A number of other companies' names, together with certain dates, are set forth in the second column, and still a third group of companies, together with dates, being set forth in the third column.

4961 There is no indication on the face of the chart what this columnar arrangement purports to reflect. Will you please state what it does purport to reflect, if you know?

The Witness: The best way would be to take an example of the West Bend Heating & Lighting Company as shown in what you call the third column, which was incorporated August 16, 1907, and which is connected with a line in the second column described as Wisconsin Public Utility Company, incorporated July 16, 1925.

4962 That company's line ends in a vertical line at the left of column 2, to which is connected a single line leading toward Wisconsin Gas & Electric Company.

I will now go back to the exact description which I gave you concerning the West Bend Heating & Lighting Company.

Mr. Binford: If I may interrupt for a moment, possibly we can shorten this. Do the companies named in the third column consist of companies, the property of which was in some manner acquired by the respective companies in the second column to which they are connected by lines?

The Witness: Yes.

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Mr. Binford: And in turn, do all companies named in the second column represent companies, the properties of which were acquired by Wisconsin Gas & Electric Company?

The Witness: Yes, if you include in your definition of properties, the ultimate acquisition of the property following an intermediate acquisition of the stock.

Mr. Binford: But the intermediate acquisition of 4964
the stock is not necessarily to be inferred in each case, is it?

The Witness: No.

Mr. Binford: So that this does not purport to reflect the manner of the acquisition of the actual physical properties in any particular case?

The Witness: That is correct. That is covered by my description of each corporation.

Mr. Binford: No objection.

The Examiner: The chart is admitted in evidence
as Respondents' Exhibit 46. 4965

(The chart referred to was received in evidence as Respondents' Exhibit No. 46.)

By Mr. Browning:

Q. Now, Mr. Van Derzee, will you tell us whether you counted the properties which are represented in this chart, and which were so acquired by Wisconsin Gas & Electric Company? A. Yes.

Q. Will you give us the total? A. The physical prop- —2,185—
erties now in the system of Wisconsin Gas & Electric Company, were at one time, except to the extent that possibly some of the property has been retired, owned by sixty different companies, individuals or municipalities.

Q. What was the effect of these acquisitions?

Mr. Binford: Objected to as too general, calling
4967 for the opinion of the witness on other than the technical subject upon which he has been qualified.

Mr. Browning: I submit, if the Examiner please, that the witness' qualifications entitled him to answer the question.

Mr. Binford: As far as the record shows and as far as the question goes, it might relate to what is the effect upon public welfare, what is the effect upon politics, what is the effect upon the ultimate concentration of stock ownership or any other subject. What kind of effect is what should be specified.

4968 Mr. Browning: I can make the question more specific and inquire what was the effect upon service and rates.

The Witness: My opinion as to the effect of the acquisition of these properties on the service and rates of the several companies and systems is that the rates were materially reduced and that the service was improved.

Mr. Schmidtman has previously testified in detail with respect to the rates. I know from my own personal experience that it was necessary for us to re-

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build parts of the systems of some of these small com-

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panies to replace the poles, put up larger wires, and I say the service was also improved.

Mr. Browning: Will you please mark for identification, as Respondents' Exhibit No. 47, this chart which consists of four sheets, the first sheet being entitled "Wisconsin Gas & Electric Company, Securities Outstanding by Classes at December 31, 1902-1939, inclusive, and as at June 30, 1940." 4970

(The chart referred to was marked for identification as Respondents' Exhibit No. 47.)

By Mr. Browning:

Q. Mr. Van Derzee, was this chart, which is Respondents' Exhibit 47 for identification, prepared under your direction and taken from the books and records of the company? A. It was.

Q. And the facts therein stated are correctly set forth? A. Yes. 4971

Mr. Browning: I offer this chart in evidence as Respondents' Exhibit 47.

Mr. Binford: No objection.

The Examiner: The chart of four sheets is so admitted.

(The chart referred to was received in evidence as Respondents' Exhibit No. 47.)

By Mr. Browning:

Q. This chart sets forth a summary of the financial history of Wisconsin Gas & Electric Company? A. Insofar as

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it goes, yes.

Q. I think the material on the chart speaks for itself, but will you point out any matters which you think should be pointed out? A. I will refer to the four pages of this exhibit, No. 47, as 1, 2, 3 and 4. Page 1 is a statement of securities
4973 outstanding by classes as at December 31, 1902, up to 1939, inclusive, and as at June 30, 1940. It is interesting to note that as of December 31, 1902, the total outstanding securities were of two issues, aggregating $1,200,000.00 par value. At December 31, 1939, they had increased to $21,611,500.00.

During that period, the number of issues increased to a maximum of ten about the year 1924, and the number of issues has dropped until at the present time there are five outstanding, indicating a substantial simplification of our financial structure in that period.

On sheet number 2 is shown a record of the mortgage
4974 bonds outstanding within the same period indicated on number 1. Here are listed the names, interest rate and due dates, of the several mortgages including underlying mortgages on the property of the company.

In 1902, the total outstanding amount of securities was $700,000.00. In 1939, the amount had increased to $10,769,000. The highest coupon rate required at any time in order to get money, was 6 per cent.

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There are also some 5 per cent. issues and there is still outstanding a non-callable issue of Waukesha Gas & Electric

Company underlying 5 per cent. bonds, but the important observation that one can make by glancing at this sheet is that the company was last able to finance its requirements by the sale of bonds at a rate of 3½ per cent., a material reduction from the high of 6 per cent.

Turning to page 3, we find a record of notes outstanding within the same period previously described. The first notes were issued in 1918 in the amount of $300,000.00 and they were 6½ per cent. of five-year secured gold notes.

At the present time, there are outstanding $1,200,000.00 4976
of 2¾ per cent. unsecured promissory notes of the company, due serially to 1946.

In between the first note issue and the last note issue the need for money required financing at a time when the credit of the company could do no better than to sell 7 per cent. notes on a ten-year basis.

On page 4 is a statement of the capital stock of the company by years for the same period previously discussed. In 1902 the capital stock at the end of the year was $500,000.00. At the present time it is $9,342,500.00.

The highest rate of dividends in any preferred stock issue 4977
of the company was 7 per cent. There were two issues of that type. On was non-cumulative participating and the other was cumulative non-participating.

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This participating reference, I recollect, is to the opportunity that an owner of the 7 per cent. stock had to participate in the earnings on the common stock after a certain dividend had been paid on the common stock.

Outstanding at the present time is the relatively new series of 4½ per cent. cumulative and non-participating stock.

4978

Q. Will you describe for us the corporate history of Wisconsin Michigan Power Company? A. Wisconsin Michigan Power Company, as presently constituted, results from the consolidation in the year 1927 of a group of companies furnishing electric, gas and electric railway, utility services in about the city of Appleton, Neenah, and the city of Iron Mountain and the neighboring communities in upper Michigan.

4979 Subsequent to the consolidation in 1927, a number of minor acquisitions of electric property occurred. On May 17, 1927, pursuant to an application previously filed, the Railroad Commission of Wisconsin, predecessor to the present Public Service Commission of Wisconsin, issued an order approving the consolidation by merger of the following Wisconsin companies with Peninsular Power Company.

The latter company's name was changed to Wisconsin Michigan Power Company in May, 1927, and these companies mentioned were Star Electric Light & Power Company, Badger Utility Company, The Weyauwega Electric Light

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4980 Company, Aurora Electric Light & Power Company, Niagara Light & Power Company, Wisconsin Light, Heat & Traction Company.

In addition to the merging of the above companies, approval was given for the purchase of the 132,000 volt Appleton substation and the Pemene Dam site, and for the purchase of all the assets subject to the liabilities of the Utility Realty Company, a Wisconsin company, and of each of the following companies operating in the State of Michigan.

Alpha Lighting Company, Iron Mountain Electric Light, Heat & Power Company, Amasa Lighting Company, Powers-

Spalding Light Company, Dickinson County Public Service Company, Loretto Light & Power Company.

Peninsular Power Company was incorporated in the State of Wisconsin on May 9, 1911. This company originally furnished electric service in and about the city of Iron Mountain, which is in Michigan, and certain iron mines in the vicinity of Iron River, Michigan.

This is a very important iron center in the upper Peninsula.

4982 On October 20, 1926, Peninsular Power Company acquired by purchase certain of the electric utility properties of Wisconsin Northern Light, Power & Heat Company, Incorporated, located about the unincorporated village of Tustin, Winnebago County, Michigan.

On May 17, 1927, the corporate name of Peninsular Power Company was changed to Wisconsin Michigan Power

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Company.

Star Electric Light & Power Company, which is one of the companies previously named, was incorporated in Wisconsin on January 15, 1923. The company rendered electric service 4983
in and about the vicinity of the city of New London, Outagamie County.

On May 26, 1927, it was merged into Wisconsin Michigan Power Company.

Badger Utility Company was incorporated on September 11, 1920, as the successor to the Pulaski Woodenware Light & Power Company. The latter company was incorporated in Wisconsin as Pulaski Light & Power Company on September 22, 1915, and rendered electric service generally in

and about the village of Pulaski, Brown County, Wisconsin.

On August 1, 1924, Badger Utility Company acquired from Northeastern Power Company certain electric utility property which had formerly been all or part of the property of the Gillett Public Service Company which operated in and about the village of Gillett, Oconto County, Wisconsin.

Gillett Public Service Company was incorporated in Wisconsin on March 6, 1917.

On May 26, 1927, the Badger Utility Company was merged
4985 into Wisconsin Michigan Power Company.

The Weyauwega Electric Light Company was incorporated in Wisconsin June 10, 1903.

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Q. Isn't that July? A. Correction. That is July. It operated a hydro-electric generating and electric distribution utility serving in the village of Weyauwega, Waupaca County, Wisconsin.

On May 26, 1927, this company was merged into Wisconsin Michigan Power Company.

Aurora Electric Light & Power Company was incorpo-
4986 rated in Wisconsin September 22, 1922. It operated an electric distribution system serving in Aurora Township, Florence County, Wisconsin. On May 26, 1927, this company was merged into Wisconsin Michigan Power Company.

Niagara Light & Power Company was incorporated in Wisconsin August 8, 1918. This company served in and about the village of Niagara, in Marinette County, Wisconsin, and also in Dickinson County, Michigan.

On May 26, 1927, the company was merged into Wisconsin Michigan Power Company.

Alpha Lighting Company was incorporated in Michigan in 1915. It rendered electric utility service in and about the village of Alpha, Iron County, Michigan. On June 4, 1927, the property of this company was acquired through purchase by Wisconsin Michigan Power Company.

Iron Mountain Electric Light & Power Company was incorporated in Michigan, April 16, 1891. At the date of acquisition of this property, on June 4, 1927, by Wisconsin Michigan Power Company, the property of the company con-

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sisted of an electric distribution system serving in and about the city of Iron Mountain, Michigan.

The Amasa Lighting Company was incorporated in Michigan on January 10, 1922. This company operated an electric distribution system in and about the village of Amasa, Iron County, Michigan. On June 4, 1927, this property was acquired through purchase by Wisconsin Michigan Power Company.

The Examiner: Let us take a recess.

(Whereupon a short recess was taken.) 4989

A. (Continued) Powers-Spalding Light Company was incorporated in Michigan on April 17, 1926, as successor to Power-Spalding Light & Power Company which was incorporated June 3, 1921. The company operated an electric distribution system in and about the village of Powers, Menominee County, Michigan. On June 4, 1927, this property was acquired through purchase by Wisconsin Michigan Power Company.

Dickinson County Public Service Company was incorporated in Michigan on May 29, 1925, and rendered electric service generally in Dickinson County, Michigan. On June 4, 1927, this property was acquired through purchase by Wisconsin Michigan Power Company.

Loretto Light & Power Company was incorporated in Michigan on March 22, 1919. This company served in and about the village of Loretto, Dickinson County, Michigan, and was acquired through purchase by Wisconsin Michigan

4991 —2,194—

Power Company on June 4, 1937.

Wisconsin Traction, Light, Heat & Power Company was incorporated in Wisconsin, March 24, 1900. Upon or shortly after its incorporation, this company succeeded to the business of the Fox River Valley Electric Railway Company and the Appleton Electric Light & Power Company.

In September, 1904, Wisconsin Traction, Light, Heat & Power Company acquired the property of Fox River Valley Gas & Electric Company.

In November, 1920, Wisconsin Traction, Light, Heat &
4992 Power Company also acquired the property of Seymour Electric Company, operating in and about the village of Seymour, Outagamie County, Wisconsin.

Of the above acquisitions and successions of the Wisconsin Light, Heat & Power Company, the Appleton Electric Power Company, which was incorporated in Wisconsin January 29, 1896, had in turn succeeded the Appleton-Edison Electric Company, incorporated July 28, 1891.

The latter company had succeeded the Appleton-Edison Light Company, Limited, which was incorporated on May

24, 1883, and Appleton Electric Street Railway Company, incorporated January 19, 1886.

The Appleton Electric Power Company had also acquired the Citizens Electric Power Company of Wisconsin, which had been incorporated in Wisconsin July 26, 1894.

Fox River Valley Electric Railway Company was incorporated in Wisconsin July 22, 1897, and was successor to

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Neenah and Menasha Electric Railway Company, incorpo- 4994
rated in Wisconsin May 10, 1892.

Fox River Valley Gas & Electric Company was incorporated in Wisconsin March 31, 1901. This company had succeeded Appleton Gas, Light & Fuel Company, incorporated in Wisconsin October 27, 1894, and Neenah-Menasha Gas & Electric Company which had been incorporated in Wisconsin April 17, 1879, as Neenah & Menasha Gas Company.

Up to April, 1923, The North American Company had acquired 95 per cent. of the common stock of Wisconsin Traction, Light, Heat & Power Company issued and out-
standing. 4995

At the time of the merging into Wisconsin Michigan Power Company, Wisconsin Traction, Light, Heat & Power Company operated, in addition to transportation and gas utilities, an electric hydro and steam generating plant located in the city of Appleton, Outagamie County, and an electric transmission and distribution system serving in and about the city of Appleton and the cities of Neenah and Menasha, Winnebago County, Wisconsin. On November 1, 1927, Wisconsin Michigan Power Company acquired by purchase the distribution system of Nadeau Brothers Elec-

tric Utility serving in the unincorporated village of Nadeau, Menominee County, Wisconsin.

On November 30, 1927, Wisconsin Michigan Power Company acquired by purchase the electric distribution system of Wisconsin Land & Lumber Company serving in the Town- —2,196— ship of Myer, Menominee County, Michigan.

On February 29, 1928, Wisconsin Michigan Power Company acquired by purchase, certain electric distribution
4997 property of the Lake States Public Service Company, serving generally the counties of Baraga, Houghton, Ontonagon, Alger and Marquette in upper Michigan.

On March 9, 1928, the Wisconsin Michigan Power Company acquired by purchase the electric distribution system of Brunswick Lumber Company, serving in the town of McMillan, Ontonagon County, Michigan.

On May 11, 1928, Wisconsin Michigan Power Company acquired by purchase the electric utility system of Delta Public Service Company serving the towns of Escanaba, Baldwin, and Brampton, in Delta County, Michigan.

4998 On May 18, 1928, Wisconsin Michigan Power Company acquired by purchase of the electric utility system of the Township of Watersmeet, serving the unincorporated community of Watersmeet, Gogebic County.

In August, 1928, Wisconsin Michigan Power Company acquired by purchase the electric distribution system of Mapleridge Manufacturing Company, serving the unincorporated village of Rock, Delta County, Michigan.

On October 15, 1928, Wisconsin Michigan Power Company acquired by purchase the electric distribution system

of Northern Sawmill Company, serving the town of Sagola,

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Dickinson County, Michigan.

On November 22, 1928, Wisconsin Michigan Power Company, pursuant to authority granted by the Railroad Commission of Wisconsin, acquired by purchase from Wisconsin Gas & Electric Company certain transmission property, including a circuit and one-half interest in towers from Appleton City Limits to a point west of Forest Junction, Wisconsin, both circuit and steel transmission towers from 5000
Forest Junction to Green Bay, Wisconsin, the circuit extending from Green Bay to Amberg, Wisconsin, the circuit from Amberg to Chalk Hills and both towers and circuit from Amberg to Twin Falls hydro-electric plant, near Iron Mountain, Michigan.

On June 5, 1929, Wisconsin Michigan Power Company acquired by purchase the electric distribution system of the Weideman Lumber Company serving in the town of Interior, Ontonagon County, Michigan.

On June 7, 1929, Wisconsin Michigan Power Company acquired by purchase the electric distribution system owned 5001
by Robert P. Kunze, located in the unincorporated village of Sidnaw, Houghton County, Michigan.

On June 22, 1929, Wisconsin Michigan Power Company acquired by purchase the electric distribution system of the Steuben Ontdoor Club located in the Township of Winchester.

On August 2, 1929, Wisconsin Michigan Power Company acquired by purchase the electric distribution system of

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Trout Creek Manufacturing Company, serving the unincorporated village of Trout Creek, Ontonagon County, Michigan.

On March 31, 1933, Wisconsin Michigan Power Company acquired by purchase the transmission power line of the Oliver Iron Mining Company located in the town of Breitung and in Norway City, Dickinson County, Michigan.

On July 5, 1934, Wisconsin Michigan Power Company acquired by purchase the Quinnesec Falls hydro-electric plant and the transmission system owned jointly by Oliver
5003 Iron Mining Company and the Chapin Iron Mining Company located in Breitung and the city of Iron Mountain, Dickinson County, Michigan, and the towns of Aurora and Niagara in Florence County, Wisconsin.

Mr. Browning: Will you please mark for identification this chart which is entitled "Wisconsin Michigan Power Company"?

(The chart referred to was marked for identification as Respondents' Exhibit No. 48.)

5004 *By Mr. Browning*:

Q. Mr. Van Derzee, was this chart, Respondents' Exhibit 48, prepared under your direction, and was the information shown thereon taken from the books and records of the company? A. It was prepared under my direction and the information taken from the books of the company and generally it has been prepared in the same manner and shows the same general information, except that there is a fourth column, as described in connection with Exhibit No. 46 in connection

with the Wisconsin Gas & Electric Company.

Mr. Browning: I offer the chart in evidence as Respondents' Exhibit No. 48.

Mr. Binford: I would like to ask one or two questions with respect to this.

Are all these transactions presently reflected upon the books of Wisconsin Michigan Power Company, that is to say, all of the transactions purported to be reflected upon Respondents' Exhibit 48 for identification?

I believe you stated that these matters were all 5006
taken from the books and records of that company.

The Witness: Yes.

Mr. Binford: They are all reflected in it?

The Witness: They are.

Mr. Binford: No objection.

The Examiner: This chart is received as Respondents' Exhibit 48.

(The chart referred to was received in evidence as Respondents' Exhibit No. 48.) 5007

By Mr. Browning:

Q. Can you state what is the full number of properties so acquired and which have gone to make up Wisconsin Michigan Power Company? A. Forty-two is the number of properties which have so entered into the Wisconsin Michigan

2,200—

Power Company.

Q. What was the effect of the acquisitions upon the rates and service theretofore given to the customers? A. Rates were lowered and service generally was bettered.

Mr. Browning: Will you please mark for identification this chart entitled "Wisconsin Michigan Power Company, Securities Outstanding by Classes as at December 31, 1911-1939, inclusive, and as at June 30, 1940"? That will be Respondents' Exhibit 49 for identification.

5009

(The chart referred to was marked for identification as Respondents' Exhibit No. 49.)

By Mr. Browning:

Q. Was this chart prepared from the books and records of the company and does it correctly set forth the facts therein stated? A. Yes.

Mr. Browning: I offer it in evidence as Respondents' Exhibit No. 49.

Mr. Binford: I would like to ask one question with respect to this proffered exhibit.

5010 On page 2 of the present exhibit and on page 4, thereof, which purport to reflect, respectively, mortgage bonds outstanding and notes outstanding, the interest rate stated is, I presume, the coupon rate in the case of bonds, or the stated rate of interest in the case of notes, is that correct?

—2,201—

The Witness: Yes.

Mr. Binford: The figures at the tops of the respective columns on the pages indicated do not purport

 5011

to reflect the actual interest paid by the company, in that they do not show the discount or premium at which the notes or mortgage bonds were sold, that is true, is it not?

The Witness: That is right. There is no inference that the bonds were all sold at par by the mere statement of the coupon rate.

Mr. Binford: The observation is likewise true, in respect of Exhibit 47, is it not, as to the Wisconsin
Gas & Electric Company? 5012

The Witness: Yes.

Mr. Binford: No objection.

The Examiner: This last mentioned chart or tabulation is admitted in evidence as Respondents' Exhibit 49.

(The document referred to was received in evidence as Respondents' Exhibit No. 49.)

By Mr. Browning:

Q. Do you have any comments with respect to this chart?
A. Page number 1 of Exhibit No. 49 shows the securities outstanding by classes as at December 31, for the period 1911 to 1939, inclusive, and as at June 30, 1940. The table begins with 1911 at which time the par value of the outstanding securities, of which there was one issue, was $750,000.00. 5013

—2,202—

As time went on, the number of issues increased to a maximum of six in the year 1929, and has dropped to four at the present time, that is as of June 30, 1940, but the total par amount has increased to $22,545,000.00.

Going to the detail, and specifically page 2, which refers to mortgage bonds outstanding within the period previously mentioned, a total amount of bonds outstanding in 1912 was \$375,000 and as of June 30, 1940, \$12,500,000.00.

In that period the highest coupon rate of any of the company's bonds or the underlying issues, was 7½ per cent. Those bonds were outstanding from the period of 1927 to 1930, inclusive.

There were also issues at a 5 per cent. rate and at the
5015 present time the entire issue of \$12,500,000 of bonds bears a coupon rate of 3¾ per cent.

As in the case of the other companies, this indicates improving credit and that the company is getting its financial house better in order.

Sheet number 3 shows the capital stock outstanding within the periods mentioned. In 1911 the total capital stock outstanding was \$750,000.00. As of June 30, 1940, the amount had increased to \$9,425,000.00.

During that long period of years, it was necessary to sell preferred stock having an 8 per cent. dividend rate. This
5016 condition prevailed from 1912 to 1917 in one of the predecessor companies.

—2,203—

There was also a long period from 1917 to 1926 when 7 per cent. preferred stock was outstanding, and from 1926 to 1938 a 6 per cent. series was outstanding.

At the present time, however, and for the last year and a half, there has been outstanding an issue of 4½ per cent. preferred stock, which indicates that the preferred stock rate has dropped to nearly one-half what it was at the peak.

The common stock of $5,425,000.00 now outstanding is all owned by The North American Company.

Page number 4 is a statement of the notes outstanding within the period previously indicated, except that no notes were issued earlier than 1921, at which time $300,000.00 gross amount was outstanding.

That amount has increased to the present time, that is June 30, 1940, to $620,000,000. At one time these notes were serial gold notes bearing an 8 per cent. rate. Those were of the old Peninsular Power Company. 5018

At the present time, the outstanding unsecured promissory note of the company, due serially 1940, bears a rate of 2½ per cent., indicating the improvement that has been made in source of financing by the company.

Q. Can you tell us what provision is made for depreciation by the three electric companies in the Wisconsin-Michigan group? A. In 1939, Wisconsin Electric Power

Company set up depreciation equal to 12.05 per cent. of the operating revenue. That amount was 2.31 per cent. of its property. 5019

Wisconsin Gas & Electric Company, in the same year, set up 12.24 per cent. of revenue and 2.74 per cent. of property.

Wisconsin Michigan Power Company set up 12.76 per cent. of revenue, and 1.77 per cent. of physical property.

The average of 188 public utilities included in the 1939 report of the Securities and Exchange Commission showed 10.88 per cent. of operating revenue and 1.9 per cent. of property. For the three companies, the depreciation reserve in per cent. of property, for Wisconsin Electric Power Com-

pany, was 28.65, for the Wisconsin Gas & Electric Company was 25.81 for Wisconsin Michigan Power Company, 14.03 per cent.; and for the average of the said 188 public utilities, 10.85.

The purpose of this table is to show that the amount of annual reservation by these three companies is substantial by comparison with what the industry is doing generally, and that the depreciation reserve in per cent. of property for the three companies is also well above the average for the
5021 188 companies.

The lowest reserve of the three companies is 14.03 per cent., which is the Wisconsin Michigan Power Company, and that is largely due to the fact that it has so much water power, and also to the fact that it is a relatively late acquisition by the company and its depreciation policies have not been in effect for as many years as in the case of the other

—2,205—

companies.

In giving these figures, I don't mean to state that we actually set up depreciation at exactly these percentages of
5022 operating revenue. These are the equivalent of the annuity and interest on reserve balances that follow the use of the sinking fund method of depreciation which is in effect for all three companies.

Mr. Browning: Mr. Examiner, in that connection, I should like to refer you to the dissenting opinion of Justice Brandeis in United Railways & Electric Company versus West, 280 U. S. 234, in which he said——

Mr. Binford: I object to the quotation. I believe a citation is sufficient for the purpose of this record at this time.

Mr. Browning: The statement in question was The Milwaukee Electric Railway & Light Company was a pioneer in the United States in setting up depreciation, and I thought it would be helpful to the Examiner to have that reference, but what I was going to read was just two sentences and it makes no difference.

Mr. Binford: I will withdraw the objection without in any way conceding.

Mr. Browning: The statement was: "The busi- 5024
ness device known as a depreciation charge appears not to have been widely adopted in America until after the beginning of this century.

—2,206—

Among street railways, The Milwaukee Electric Railway & Light Company became a pioneer by adopting it in 1897."

(Discussion off the record.)

By Mr. Browning:

5025

Q. Have investors in the securities of the companies in the Wisconsin-Michigan group been unable to obtain the information necessary to appraise the financial position or earning power of the issuing company because of the absence of uniform standard accounts? A. No. The company is using the Uniform System of Accounts prescribed by Public Service Commission of Wisconsin and designed to be in conformity with the requirements of the Uniform System of Accounts prescribed by the Michigan Public Utilities Commission for electric utilities.

The present Uniform System of Accounts was made effective January 1, 1938, and it has superseded the classification which has been in effect for a great many years issued by the former Railroad Commission of Wisconsin.

Q. Your answer was designed to apply to all three companies, I take it? That is, to Wisconsin Electric Power Company, Wisconsin Gas & Electric Company, and Wisconsin Michigan Power Company, except that the Michigan Commission's rules only apply to the last-named company? A.
5027 That is right.

Q. Do the public utilities in Wisconsin publish any finan-

—2,207—

cial information? A. Yes, with respect to the information relative to the financial position of the companies, the public utilities of Wisconsin are obliged to publish by March 15 of each year, a complete statement of the assets and liabilities as appearing in their reports to the Public Service Commission in detail. It must be placed in a newspaper of general circulation so that anyone interested can get the information.

Q. Have any of these companies issued securities without
5028 the approval or consent of the states having jurisdiction over them? A. No. The issuance of all securities by public utilities in the states of Wisconsin and Michigan can be made only upon the consent and approval of the regulatory bodies of those states.

Q. Have the three companies issued securities upon the basis of fictitious or unsound asset values having no fair relation to the sums invested in them or the earning capacity of the properties?

Mr. Binford: Objected to upon the ground that the question as framed, being in the words of the statute

referred to, calls for a conclusion of law from the witness.

Mr. Browning: I don't agree that that is a conclusion of law.

Mr. Binford: The interpretation of those words as used in the Statute and as quoted apparently by Mr.

—2,208—

Browning, are words of law.

In effect, the witness is being asked whether or not
certain recitals in the Public Utility Holding Com- 5030
pany Act of 1935 are or have been applicable to his company. I believe that is a question of law.

The Examiner: Read the question to me now again.

Mr. Binford: If it is not a question of law, it is certainly a question of ultimate rather than evidentiary fact.

(Whereupon, the pending question was read by the reporter.)

The Examiner: I overrule that objection.

Mr. Binford: Exception. 5031

Mr. Browning: Do you want to read the question to the witness?

(Whereupon, the pending question was reread by the reporter.)

The Witness: The state regulatory commission, prior to granting their consent for the issuance of any kind of securities, either in the state of Wisconsin or Michigan, conduct a very thorough and careful examination of the companies' financial condition and

operations and say, themselves, that the proposed issue of securities are supported by sound asset values and bear a fair relation to the sums invested.

—2,209—

By Mr. Browning:

Q. Do the three companies issue securities upon the basis of paper profits from inter-company transactions, or in anticipation of excessive revenues? A. No. The Public
5033 Service Commission of Wisconsin, under its general order known as 2-U-2, issued June 11, 1931, requires that all contracts or agreements, whether oral or written, shall be approved by the Commission if they are entered into with affiliate interests. They have to be filed with the Commission and they are very carefully investigated.

I have something to do with that matter, myself, and very seldom is an affiliate agreement of any kind sent to the Commissions for approval that does not have a good many questions asked about it so that their files relate the entire circumstances surrounding the case. Sometimes there are
5034 hearings.

Q. Well, do you have paper profits between your companies? A. We have no paper profits.

Q. Has any of the three companies issued securities under circumstances which subjected it to the burden of supporting an over-capitalized structure tending to prevent voluntary rate reductions?

Mr. Binford: Objected to as calling for an opinion of the witness.

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The Examiner: Well, what have you to say to that, Mr. Browning?

—2,210—

Mr. Browning: I think the witness is well qualified to answer the question. The charge that is made against us is that this practice is intended to prevent voluntary rate reductions. The charge is entirely unjustified. It is not a fact. I think we should be entitled to put that in.

Mr. Binford: I beg to differ as to any such charge 5036
of such character being made in this proceeding. Mr. Browning endeavors to construe the introductory portion of the Public Utility Holding Company Act of 1935 reciting abuses which led to the enactment of that Act as expressed by Congress as an indictment of his particular clients in this particular proceeding which he is called upon to answer. I fail to see that that is an issue before us at this time.

Moreover, I still assert and insist upon my objection to the effect that the question calls for the opinion
of the witness. There are certain matters requiring 5037
expert knowledge as to which opinion evidence may be given as such, but as to conclusions of ultimate fact those things are for the tribunal which ultimately must judge the case and they are not to be answered by a particular witness upon the stand.

Mr. Browning: I submit that this witness, by his training and qualifications, is so well qualified to express opinions on these questions that the tribunal which is ultimately to decide those questions ought to wish to have his opinion.

The Examiner: I will permit the witness to answer the question and you may have an exception, Mr.
—2,211—
Binford.

Mr. Binford: Thank you, sir. I will take the exception.

The Witness: Well, it is true that all public utilities operating in the state of Wisconsin and in the state of Michigan can issue securities only upon the
5039 consent and approval of the regulatory commissions of those states.

The point that Mr. Browning made that related to whether or not rate reductions were being held off because of securities being issued that should not be issued, I would like to state my intimate knowledge of the methods of regulation in Wisconsin and Michigan, which determine rates entirely independent of securities and based only on the fair value of the property.

I have had too intimate dealings in the last 28
5040 years with proving property and having the figures used in the determination of rates, without any reference whatever to securities to believe that any rate reductions are interfered with by improper issuance of securities.

By Mr. Browning:

Q. That is, the two things simply aren't connected. Rates are based on a rate base. A. Yes.

Q. Which is independent of securities issued. A. In the case of Wisconsin Electric Power Company, for example,

the old Railroad Commission of Wisconsin made an inventory and appraisal of January 1, 1914. I personally worked very close to that, supplying information that the Commis-

—2,212—

sion wanted at that time. The inventory of physical property, when finally completed, was appraised by the Commission and certain value set, and it is on the basis of that January 1, 1914 appraisal which happens to give a value less than the actual book figures that net property additions are added from that time to this to determine the rate 5042
base. It has no relation to securities whatsoever.

Q. Are your three electric companies subjected to excessive charges for services, construction work, equipment and materials by The North American Company? A. No, no payment is made to The North American Company for services, construction work or equipment.

Q. Have they entered into transactions in which evils have resulted from an absence of arm's length bargaining or from restraints of free and independent competition?

Mr. Binford: Mr. Examiner, I haven't objected to 5043
the last two questions but I wish to object most strenuously to that; it requires the opinion of the witness as to what is evil and it is certainly a thing upon which I have never heard of expert opinion testimony being offered.

The Examiner: I will sustain that objection.

Mr. Browning: Mr. Examiner, I find myself at a disadvantage because I should be the first to concede the nonsense that was placed in this statute. The witness has just pointed out the nonsense in the preced-

ing question. I find myself at a disadvantage, there- —2,213—
fore, in dealing with it.

By Mr. Browning:

Q. Has control of your electric companies by The North American Company affected the accounting practices and rate and dividend policies of such companies so as to complicate and obstruct state regulation of such companies? A.
5045 No.

Mr. Binford: I had no opportunity to object to that question before it was answered. Therefore, I now move to strike both question and answer, insofar as the question relates to the effect of The North American Company's influence upon state regulation, in that that, again, calls for the opinion of the witness.

There was a witness before this who might possibly have been qualified to express an opinion upon that subject but I do not believe that this witness has
5046 been a member of any regulatory body insofar as the record shows, which would qualify him to answer the question as an expert, nor is he now asked to state any facts which might lead to a conclusion by the Commission or the Courts as to the truth or falsity of the statement. He is merely asked for his own personal feeling in the matter, in effect, and at best his opinion.

Mr. Browning: Mr. Examiner, this witness has had a very intimate contact with state regulation. He has had a contact which has extended over a period of some 27 years. He has an acquaintanceship and

 5047

a knowledge of that subject which cannot possibly be
—2,214—
duplicated here.

(Discussion off the record.)

The Examiner: I think that the experience and activities of this witness before and with the regulatory bodies of Wisconsin and Michigan should be more clearly established in this record as a predicate for this question. 5048

By Mr. Browning:

Q. Have you had any contact with the Public Service Commissions of Wisconsin and Michigan? A. I have had quite extensive contact with the Public Service Commission of Wisconsin and a lesser contact with the Public Service Commission of Michigan. My contact with the Public Service Commission of Wisconsin goes back to 1914 and at that time, as I stated a few moments ago, I was very intimately connected with the valuation work of our property which was under the direction of the Public Service Commission of Wis-
consin. 5049
I was the individual in the company then rated as assistant to the vice president who had charge of all of the contacts with the Commission engineers from the time the inventory was started until the appraisal was completed.

That experience involved a rather basic grounding in the making of appraisals of public utility property, in fact the valuation of January 1, 1914 of The Milwaukee Electric Railway Company has been referred to in subsequent years as one comprising great detail and the particularly good chapter on various overheads of construction that went with it.

—2,215—

My personal duties at that time, in addition to taking care of the company's end of seeing that all the property was counted, included many discussions with the engineers of the Commission as to the proper price to be placed. The Commission did not just arbitrarily state, "We are going to use this figure". The Commission engineers asked us to produce evidence that prices of underground corduit poles and machinery as proposed by us were correct.

We had long and detailed discussions on what is the
5051 proper amount for interest during construction, what is a proper amount for omissions of inventory, what should be allowed for insurance, injuries and damages, and in fact in the three years that were involved in the making of the inventory before the inventory was finally priced, I think I went through every classification of inventory and appraisal work as applied to a rather large property.

After that time I had charge of rate contacts, all of them, for The Milwaukee Electric Railway and Light Company, Wisconsin Gas and Electric Company, and Wisconsin Michigan Power Company. I appeared at the request of the
5052 staff to discuss rates informally. I have appeared before the Commission to discuss rate problems of the company informally and I have appeared in many formal casses before the Commission and discussed the philosophy of rate-making in all its various aspects.

—2,216—

I have appeared before the Commission as a representative chosen recently by the utilities of the state to open up the discussion on various new rules and regulations which the Commission propounded and which the companies of the

state objected to because of the fact that it appeared to the companies that the Commission was endeavoring to enter the field of management through the route of regulation.

I have, in the field of accounting, appeared before the Commission on many different subjects and over a long period of years and on the Classification of Accounts with particular emphasis on important topics such as depreciation. I have put in testimony from time to time in connection with rate discussions on cost of money, rate of return, financial
requirements viewed in relation to what you need to service 5054
your debt and cover your preferred stock dividends and your common stock, and for surplus.

I haven't had occasion ever to tell anybody on short notice just what are all the things that I have done in the field of regulation.

(Discussion off the record.)

The Examiner: Let's go back on the record now and let the witness finish his answer, unless you want to ask a question.

The Witness: In connection with the appearance before both the Commission and the staff in the mat- 5055
ter of rates, I have personally developed, for example, the "Ten for One" plan which was described by Mr.

—2,217—

Schmidtmann. I developed it and I named it. I had to sell it to the staff and to the Public Service Commission of Wisconsin so I have been active in the field of rates which is one of the end-products of the Public Service Commission deliberations.

With respect to the Public Service Commission of Michigan, my earliest contacts with that body were about the time that our interests acquired Peninsular Power Company. I participated in a rate case before that body probably as far back as 1925.

One of the things that I remember about that particular case which looks strange in the light of present day conceptions was that they thought perhaps the depreciation was a little bit low and agreed that after
5057 earning eight per cent. on the investment we would have to put the balance in depreciation reserve until a certain figure was reached.

Those conditions, of course, are far away and long ago.

Shortly after the instance I just cited, and after we had completed a valuation which I had charge of for all of the various properties that went into the consolidation of Wisconsin Michigan Power Company, I appeared before the Michigan Commission and explained and had approved the valuation of the physical
5058 property of that company. One of the instances of that particular appearance, which was about 1927, as I recollect, was the look of amazement on the faces of the Commissioners when I volunteered that the company was not interested in reproduction cost for the making of rates or had never been up to that time,

—2,218—

and as far as I could see did not expect to be in the use of cost of reproduction.

I have had various contacts from time to time since then with the Michigan Commission, but infrequently.

The personnel set-up, methods of operation, are quite like the Wisconsin Commission although they haven't been as intimately into the details of things for as long a period of time.

I personally sign all of the rate sheets that go to the Michigan Commission and the Wisconsin Commission for all the companies in our group. I mention that merely to indicate that I still keep in active touch with matters of rates, methods of formulating them, and that I have a date for a personal appear- 5060
ance before the Public Service Commission of Wisconsin about the middle of October which will involve a long discussion on the question of the ability of the company at this time to make further reductions in rates and the relation of that problem to the future.

By Mr. Browning:

Q. As one of the general executive officers of the three companies, have you been in general charge of all matters in connection with the Commissions for some time? A.
While there has been no line diagram stating that I am in 5061
general charge, I keep in contact with all important matters that are coming before the Commission and participate actively in the formulation of the character of information that is to be given before them where any important rate

cases are involved. I don't go out there on every little discussion of claims and minor changes in rates. I have an assistant, Mr. E. J. Steinberg, who is called an executive assistant, who devotes practically all of his time to the minor operations and rate problems of the three companies.

Q. You are in intimate contact with the policies of the companies in dealing with the Commissions? A. I am.

The Examiner: Now, the state of the record is that the question propounded and the answer of the witness is in the record and there is a motion pending to strike both from the record.

Now, I understood, Mr. Binford, you wanted to make some additional objections.

Mr. Binford: I wish to add to that motion which
5063 has not been passed upon.

The Examiner: All right.

Mr. Binford: May I have the question read?

The Examiner: Yes.

(Question indicated was read back.)

Mr. Binford: As previously stated and in the form previously stated, I renew my motion to strike the question and answer upon which the Examiner reserved ruling, and upon that motion which has not yet been passed upon, we wish at this time to have
5064 the following additional grounds therefor:

—2,220—

First, that it has not been shown that the common ownership of the three companies suggested by the question has affected the methods of accounting and other practises mentioned in the question of the three companies.

Secondly, that the question upon its face shows that it is a continuation of an attempt to interject as an issue in this case the question of whether the particular evils which the Congress in Section 1 of the Holding Company Act of 1935 found to be wide-

spread and to call for the enactment of that Act are or have been particularly present in the case of the instant respondents.

The Examiner: In other words, you say it is irrelevant?

Mr. Binford: And therefore the question and all questions along that line are irrelevant to the issues in this case.

Thirdly, the testimony given by the witness, since the question was propounded, is still insufficient to 5066
establish a predicate for an answer thereto by him.

The Examiner: I am going to reserve ruling on this motion and will dispose of it before the direct examination of the witness is concluded.

By Mr. Browning:

Q. Mr. Van Derzee, has any of the three companies ever defaulted in the payment of interest or principal upon any obligation or in the payment of any dividend upon any preferred stock?

—2,221—

The Witness: No, there have been no defaults in 5067
the payment of interest or dividends on preferred stock.

Mr. Browning: I think we have reached a good stopping point, Mr. Examiner.

The Examiner: All right, we will recess until 10:00 o'clock tomorrow morning.

(Whereupon, at 4:40 o'clock p. m., the hearing adjourned to reconvene at 10.00 o'clock a. m., the following day.)

—2,222—

5068 BEFORE THE

Securities and Exchange Commission

Docket No. 59-10

IN THE MATTER

of

THE NORTH AMERICAN COMPANY, *et al.*

5069 Hearing Room 1101,
Securities and Exchange Commission Building,
Washington, D. C.,
Tuesday, October 1, 1940

Met, pursuant to adjournment, at 10:00 o'clock a. m.

Before: W. E. SWIFT, *Trial Examiner.*

5070 Appearances:

S. PEARCE BROWNING, JR., and CHARLES S. HAMILTON, JR., of Sullivan & Cromwell, 48 Wall Street, New York City, Attorneys for the Respondents.

RALPH C. BINFORD,

HERMAN O'DELL, and

MISS E. H. CALKINS, Attorneys on behalf of the Securities and Exchange Commission.

PROCEEDINGS

The Examiner: The hearing will come to order.

Whereupon, Gould W. Van Derzee resumed the witness stand and testified as follows:

Direct Examination by Mr. Browning (Continued):

Q. At yesterday's hearing you gave some comparative statistics with respect to the depreciation provision and reserve of your three electric companies as compared with the 5072 average of 188 public utilities published by the Securities and Exchange Commission and you were asked to check the basis of these figures.

Will you please tell us the basis you used? A. All of the figures which I quoted for the three companies in the Wisconsin Michigan group and figures for the 188 companies I found in a report of the Public Utilities Division of the Securities and Exchange Commission entitled, "Financial Statistics for electric and gas subsidiaries of registered public utility holding companies, Year 1939", on page 3 thereof. In other words, all of the comparative figures were obtained 5073 from said volume and presumably are on the same basis.

The column that relates to the per cent. of operating revenue is headed, "Per cent. depreciation of operating revenue." The column that relates to the depreciation in per cent. of property is headed, "Per cent. depreciation of property", and the column relating to the accumulated reserve

is headed, "Per cent. depreciation reserve of property".

I understand that these percentages are taken from the income accounts with respect to revenue and the balance

sheet items with respect to depreciation so that they would, therefore, show depreciation insofar as it relates to a per cent. of property as a per cent. of property shown on the balance sheet as per books, it would be total property.

Q. At the close of the hearing yesterday I asked you whether any of the three electric companies had ever defaulted in the payment of any interest or principal on any indebtedness or in the payment of any dividends on preferred stock, and I am not sure that your answer covered the question of payment of principal.
5075

Has there ever been any default in the payment of principal of any indebtedness? A. There has been no default in the payment of principal of any indebtedness. There is also another item that should probably be mentioned and that relates to the payment of preferred stock dividends. They have been paid continuously since 1900.

I did not mention that on the early issue of non-cumulative preferred stock which I believe was issued in 1896, no dividends were paid until approximately 1900 because I did not consider that failure to pay non-cumulative preferred
5076 dividends constituted a default.

—2,225—

By Mr. Hamilton:

Q. Mr. Van Derzee, will you refer to Respondents' Exhibit No. 32, being the map of the three companies, and particularly to the territory and transmission lines in and about the community of Cooks in Schoolcraft County, I believe, in Michigan, and the community of Michigamme, in Marquette County, Michigan.

Will you state whether the lines I have just referred to and the surrounding service territory were acquired

by Wisconsin Michigan Power Company pursuant to any particular plan of acquisition? A. The two lines to which you refer were acquired for the interests of Wisconsin Michigan Power Company if not immediately by Wisconsin Michigan Power Company, as a part of a general plan for a system in the upper peninsula.

It so happens that up to the present time conditions have been not just right for the interconnection of these two systems directly with the balance of the system but the lines are a part of the long-term program designed for intercon- 5078
nection at the proper time.

We have had negotiations, particularly with respect to intervening properties in between the village of Cooks and the point where power is purchased from the Cliffs Power and Light Company relating to taking on more property now owned by others. These negotiations come to life periodically, in fact within the last few months I have

—2,226—

received letters from representatives of the ownership of the most substantial property in between Cooks and Cliffs asking if we are now ready to look into the matter further. We 5079
have replied that we are interested and it is primarily a question of price. That is where the matter stands at the moment.

The acquisition of more of the intervening property in between Cooks and the point where power is purchased by the Cliffs Power and Light Company for that line will be a material factor in the time that our lines may be extended from another point on the system so as to interconnect. We expect that that will be done, in fact I had to do with the laying out of the original line down to Cornell.

If my recollection serves me right that is a 66,000-volt line and the high voltage was made available so as to provide a source of power beyond that point. When we originally acquired the system from Michigamme leading in a general westerly direction to the point on the map where power is purchased from the Cliffs Power Company, we had in mind ultimate connection across from Sidnaw to the west. It was about the time that we had acquired some substantial water power sites on the Sturgeon River which is in the township
5081 of Baraga and flows into Lake Superior.

The idea was that at the appropriate time we would make a development on the Sturgeon River and then run high voltage lines approximately due southeast towards Twin Falls where the 132,000-volt line of the company now

—2,227—

terminates, and would tap the line not now existant between Sidnaw and Michigamme to bolster up the voltage at that point.

We also had in mind at that time further extension of our own lines from some point near where Cliffs Power Company
5082 sells power to a point in the general neighborhood of Cornell, making a form of loop which would be advantageous in the supply of power entirely by our system if we should ever have outages that require rerouting of service.

Q. The map is stated to be of a scale of 10 miles to the inch. Would you approximate the distances between the transmission line terminating at Sidnaw and the transmission line originating at Michigamme? A. I would say about 30 miles.

Q. And similarly from the community of Channing in Dickinson County, to Michigamme? A. Between 20 and 25 miles.

Q. And if you will, the approximate distance from the community of Perkins in Delta County, I believe, to the community of Cooks in Schoolcraft County? A. Between 25 and 30 miles.

Q. Both the transmission line running from Cooks and the transmission line running from Michigamme are connected with the system of Cliffs Power and Light Company, are they not? A. They are.

—2,228—

By Mr. Browning: 5084

Q. Does the management of your utilities involve problems of a diverse nature, Mr. Van Derzee? A. Yes, there is a great variety of problems in almost every field of activity. I have testified previously that financing involves quite a variety of very complex and continuing problems. The generation, transmission, and distribution of electricity involve many problems of a different kind and some of them are extremely technical in nature.

In the field of generation for example, the determination of the proper time at which to add additional generating
capacity and the determination of the place at which such 5085
capacity shall be added are important problems, in fact they are major problems. Extensive studies are made of the costs and advantages of alternative locations at which plants may be placed in order to have the most effective and most efficient location and at the same time with due regard for the future requirements of the system.

After we determine the location of a power plant there are a great many technical problems that have to be solved. They relate to the selection of the proper type of generator

5086

and the discussion of the generator, itself, involves a good many problems. If it is a new station the question of the proper type of voltage and the proper steam pressure to be used in the turbine and the point at which the most load will be carried for the longest time comes into the picture.

—2,229—

If it is an 80,000 kw. turbine and your average load is going to be 60,000 kw. then you would be foolish not to design the turbine so that you get the maximum efficiency
5087 at three-quarters load.

There are a great many problems in the proper selection of boilers. There are innumerable problems in connection with the determination of the hundreds of auxiliaries of various kinds that go into the make-up of a station.

We had a little problem that may be of interest to you in connection with the determination of temperature of steam. It doesn't sound like an important problem but one of the engineers came to us and said, in effect, "We think that we ought to reconsider the steam temperature of the steam to be used. Instead of 825 degrees F. maybe we should go to 900
5088 degrees F."

Well, we said, "What does that involve?"

After examining the question with the boiler makers, the turbine makers, the makers of pipe, we found that altogether it would add about $100,000 to the cost of the additional capacity in order to raise the temperature 75 degrees. They found that with that increase in temperature we could probably save, say, $12,000 worth of coal per year so the problem of management was, Is $12,000 a year worth saving with an investment of $100,000?

To the average engineer that looks like a 12 per cent. return but we can't overlook the fact that taxes and depreciation over the life of the property take fully half of that amount, leaving only a 6 per cent. return on the investment,

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and if there are other places where $100,000 can be used to greater advantage that will help tend towards reduction in rates by accomplishing a larger saving than that, then that is the place for the $100,000 and not in equipment necessary
to raise the temperature of steam 75 degrees. 5090

The general executive officers of the company don't make these studies but they direct that they be made and it is quite essential that the general executive officers be able to pass intelligently upon the problems that come before them of the nature that I have indicated.

A typical problem in the field of transmission would be the selection of suitable transmission line. We have such a problem now in connection with Port Washington No. 2. Should it be a wood pole "H" frame construction line with long spans of aluminum wire and a steel core, or should it be
a steel tower line involving copper conductors, shorter 5091
spacing and smaller wire?

In this particular case it happens that the company has need for a single circuit line, at least it has need for it at sometime connecting Port Washington and the Granville sub-station at the outskirts of Milwaukee. Right now we have one 80,000 kw. turbine and two transmission lines, each one of 90,000 k. v. a. capacity, so that if one line is out there is a reserve line to carry the output of the generator.

—2,231—

5092 *Gould W. Van Derzee—By Respondents—Direct*

The ultimate installation at Port Washington is expected to be four 80,000 kw machines. It is obvious that at such time we need at least the additional transmission line of 132,000 volts, so that in case of outage of one of the lines we will have one spare and the problem of whether we shall now put in that single circuit line which would be the fifth line upon the completion of the whole project, or whether we shall now put in a set of steel towers capable each of holding two circuits at greater present costs, is one of the
5093 problems of management in connection with transmission lines.

My own inclination is to save the money. While we think we are going to build a station to ultimate capacity one never knows. We haven't an abundance of available capital so I think the decision of the management will be that we will put in the "H" frame construction with a longer spacing, aluminum wire with steel core, and perhaps avoid an investment of $100,000 that would be involved in putting in steel towers capable ultimately of carrying two circuits.

In connection with those problems there are such little
5094 minor engineering questions as what are the facts with respect to corona losses in transmission lines? The larger wire that goes with the aluminum construction and steel core has somewhat less corona losses than the smaller copper wires of the same conductivity, both operating with the same voltage and spacing, but that is not a particularly important problem in these determinations and I merely mention it to

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indicate that there are diversion problems in what appears to be a simple field of transmission that involves engineering

knowledge for the executives to pass intelligently upon those things that are brought before them for decision.

A typical technical problem involving distribution of electricity we find in the downtown district of Milwaukee. We had to determine sometime ago whether we were going to continue direct current distribution in the downtown district continuously or whether we should go to some other more economical form of distribution. Many large cities, in the downtown areas, have inherited the direct current
system. It was the system originally designed by Mr. Edi- 5096
son and was known as the Edison Three-Wire Direct Current Distribution System.

In those days voltages were low; distances were short. 230 or 240 volts across the outside wires of the Three-wire system, that is from the positive to the negative, represented the voltage in use. Naturally when you start a system you have to continue it for sometime and so 240 volts between positive and negative wires has continued in the case of the downtown distribution system of Milwaukee, with 120 volts between either outside wire and the so-called neutral wire.

Power is taken off the 240 volt wires and lighting for 5097
the average incandescent bulb is taken off the circuit between the outside wire and the neutral wire.

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The transmission of power by such a system in a downtown district was recognized a number of years ago to involve inherent disadvantages. Buildings were getting higher, air conditioning was beginning to be required by customers and lighting loads were growing with great rapidity. The source of direct current for these downtown buildings was from sub-stations. As a rule they are known

as converter sub-stations and in them are rotary converters which obtain their source of power from an alternating current line and such alternating current is converted into direct current required for the Edison Three-wire System.

The growth of direct current load means more sub-stations in downtown areas because you cannot transmit direct current long distances. The picture before the management was of buying very expensive downtown property with the possibility that zoning or other restrictions might not
5099 even permit the installation of such rotary converter substations. It involved continuous extension from such substations of larger and larger cables and more of them in order to supply the needs of these buildings that were continually going higher up into the air.

So we adopted, after considerable study, a long-term program of gradually converting the downtown area from direct current Edison Three-wire distribution system to the alternating current work system. We had in mind at that time that it might take 25 or 30 years to bring about the change.

5100 A great problem of management in connection with such an undertaking was to determine first what is the best

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system to use, and then, how shall it be carried out? We didn't want to rush foolishly into such a program when we didn't need to. We had the consideration of making the old direct current equipment last its useful life. We had considerations of human nature to take into account and human nature is involved in problems of this kind.

Suppose we were to go to a large office building and

say, "Well, we are just dead anxious to change you over from direct current to alternating current. The capacity of our direct current system is right up to the limit. We must make the change." The obvious answer of the building owners is, "Well, come on in boys, but don't charge us anything."

Right away you get into the problem of changing hundreds of pieces of expensive apparatus used by doctors, thousands of direct current motors to alternating current
motors. They would even charge you for the sub-station 5102
space in the basement, so that isn't the method of approach, but somebody has to decide that.

I know of instances where that has been the method of approach and it has cost a great deal of money so we started early and the natural inclination of business and property owners in the downtown district was to come to the company and ask if they could at sometime have alternating current service; because we were still able to supply them with direct current we said, "Yes, you can have it in accordance with the rules that we have filed with the Public Service

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Commission of Wisconsin," and that involved supplying alternating current service from the new A. C. network providing it was a new building, providing that the load was at least 75 kw., and there were some other conditions that were favorable, not so much to the company but to the ultimate customer.

It would not be fair to saddle onto the cost of other classes of service or even onto commercial service as such, the great expense of an ill-considered change from direct current to alternating current. Now we get the use of these

large spaces in the basements of buildings under the sidewalks for nothing. They are glad to get the service and we make the change when we don't have to pay for the cost of changing the equipment of the customer. We expect to do it over a period of a great many years and to the ultimate advantage of the customers.

The technical reason why the expense is so much less for
the alternating current system than the direct current sys-
tem is that the capacity of a cable for carrying power is a
5105 direct function of the voltage impressed on the cable. If
you have 13,200-volt cables, as we do servicing each one of
these customer sub-stations in the alternating current net-
work, it is obvious that with the same size of cable in the
old ducts that carried direct current cables before, many
times the amount of power can be transmitted.

Now, there are managerial problems of a different kind involved in the determination of sales policies. Engineer-

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ing skill, without parallel sales push, would be useless. We
would be all dressed up and no place to go, so it is important
5106 that some degree of intelligence be directed so far as we
are capable to the determination of proper salesmen and
policies. They involve at many stages the direction of the
proper place to put your emphasis.

As an example of that, a number of years ago we saw a big field in electric water heating in the homes. We knew, first, that we had to have a very low rate for current in order to sell electric water heating. In order to get a low rate for current, you can't have very many fixed charges attached to the rate. The current is used at a time when

other people are not demanding service and that means largely in the night hours.

We developed a storage electric water heater. We had it made, as I believe I testified a few days ago, by the Hevi-Duty Electric Company because at that time you could not go to all the different manufacturers and just pick a well-developed electric water heater off the shelf. If that had been the case we would have had no occasion to be thinking about developing the electric water heater business. Somebody else would have already developed it and the manufacturers 5108
would have handled the problem, perhaps, but we found considerable usual delay.

We decided that the time during which the current could be used for heating the water in the homes was a period of ten hours ending at 7:30 in the morning and beginning at

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9:30 the following day. With a period of ten hours for heating all the water you are going to use the next day, you have to have a fairly good-sized tank. We developed sizes of 50, 80, 120 and 160 gallon tanks and put suitable units in the bottom and top of them in order to get the water up to 140 5109
degrees in that 10-hour period and also in the case of unusual demand for water by the householder resulted, we had another unit in the top of the tank which was connected directly across the house meter terminals and if the customer wanted heat in the daytime he had to pay the regular rates but very seldom was that the case.

The terminals supplying current to the lower unit were behind the meter because of a flat rate and we charged so-much for electric water heating service when you had a 50-gallon tank and so-much when an 80-gallon tank was used. The service was quite popular.

5110

It developed, however, that because of the short time for heating water the cost of apparatus was greater because the tank had to be larger and so we set about later developing an alternative proposition involving a smaller tank and an increase in the hours of charging, so-called, from 10 to 16 a day. We picked out a period in the night when the current could be used without interfering with the distribution of the plant peaks and periods in the daytime such as the natural let-up of industrial activity at the noon hour and for quite
5111 a while thereafter, and together we have now a 16-hour charging period with an 88-mill rate for it and the cost of

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water heating in the home is quite competitive and it is very popular. That represents one of the problems that management had to get in on. I, personally, worked extensively on that particular problem.

There are other types of managerial problems. The field of accounting requires managerial attention. It involves complex problems which require a knowledge of both accounting and engineering. Under the classification of ac-
5112 counts the Public Service Commission, effective January 1, 1938, companies were required to make comprehensive depreciation studies and to indicate within a certain period the justification for the type or method of depreciation accounting desired by the company, if it desired to differ in any way from straight line depreciation, which was practically laid down as preferential in the Classification of Accounts.

The determination to continue to use the sinking fund method which our companies had employed for a long time with the 3½ per cent. interest charge on reserve balances

was a managerial problem, with which the management was in close contact for a period of two and one-half years prior to the time that the Commission issued its order making the sinking fund method of depreciation accounting effective.

The management should be able to understand problems of that type and I am glad to say that not only the general executive officers understand the distinctions between straight line and sinking fund depreciation accounting with

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its various ramifications, but that the executive committee 5114
as a whole has a good working knowledge of that subject and it was very much in discussion at the proper time.

We have borderline cases between capital expense and maintenance expenditures which find their way up to the management for discussion at least. Comptrollers are, of course, men who are by training and qualification best able to expound the subject of what is the proper account to use but sometimes a little knowledge of engineering and accounting and practical application of the thing that is being discussed goes a long way to clarify the mind of the accountant that may possibly not have had an engineering background. 5115

We have a problem just like that in the shop now. The generator winding of a 30,000-kw. unit at the Lakeside plant burned out. We were all much surprised to find that the cost of replacing that generator winding was $50,000 and we were quite shocked with the magnitude of that expenditure. We checked it up very carefully with friends of ours in the turbine business who had not made the turbine of which the coil burned out and they just told us off-hand, "That ought to cost about $48,000."

Well, now we all know what units of property are, or we think we do. A unit of property is something that you can write out of the property account and replace by a charge for the new unit to capital and charge the old one to depreciation reserve and credit the reserve with whatever scrap

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value there is in it and charge the reserve for the cost of removal.

Was this $50,000 expense in replacing a winding a capital
5117 charge or a maintenance charge? Well, notwithstanding the definition of units of property there are some collateral interpretations which read to the effect that improvements in what might be elements of property, if they affect the efficiency of the machine or the life of it, generally make a betterment out of it, can be considered as a capital investment. So there was a problem that the management had to face.

Should the cost be charged to maintenance or should the new winding be charged to capital and the old winding retired? These and many other accounting questions involving both engineering and accounting find their way to the desk of
5118 management.

(Discussion off the record.)

The Witness: We come to one of the last fields in which management has to delve and that is in the field of customer relations. In that field arise some of the more difficult problems of management. They are different from other problems because there are no set accounting and engineering rules by which the satisfaction of the customer with the service can really be determined.

After all, the customer is fundamentally interested in efficient service at low cost. He has no knowledge and probably has no interest in the problems that the company has. He does not care whether we use a

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boiler made in Timbuctu or some other place. Of course, the over-all effect of good general management rebounds to his benefit, but he has not any particular interest in the details of how we accomplish that re-
sult. That is what he pays us for. He is too busy 5120
with his own problems to have any great concern in ours. He is a local customer dealing with a local company, manned by local people.

Thus we see the great diversity of problems which reach the desk of the management.

Mr. Browning: Will you please mark for identification this chart entitled, "Wisconsin Gas and Electric Company, Electric, Gas and Transportation Systems."

(Chart was marked for Identification as Respondents' Ex. 50.)

5121

By Mr. Browning:

Q. And does it correctly set forth the facts which it purports to set forth? A. It does.

Mr. Browning: I offer it in evidence as Respondents' Exhibit No. 50.

Mr. Binford: No objection.

The Examiner: This chart is admitted in evidence under the number assigned to it.

(Chart admitted in Evidence as Respondents' Ex. 50.)

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By Mr. Browning:

Q. Does the local character of your problems vary? A. Yes, the local character of our problems varies quite extensively but before going into the details of just how that variation occurs I think it would be well to get a certain
5123 amount of background which I can give you best by reference to the last exhibit which has just been presented.

The exhibit shows, by outlining, what the various divisions and districts of the operating territory are of Wisconsin Gas and Electric Company. This, I think, is a typical company having far-flung districts and I will now describe where these districts are and how the company is generally operated within the districts and divisions.

Starting at the lower right-hand corner of the map, the word "Kenosha". That refers to Kenosha County but you will find a line drawn north and south about through the
5124 letter "N" as it appears in Kenosha which is the west boundary of what we call the Kenosha division. The Kenosha division is generally that part of the county of Kenosha east of the line just described. The head office of the division is at the city of Kenosha. The division manager is Mr. H. M. Pauley who operates from that point. He is a man 52 years old and has been with the company for 23 years. This division is so relatively small that it is not necessary to have what are called local agents distributed throughout the property.

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The next division to the north is the Racine division. The Racine division is outlined in the color brown. The Racine division has its main division office at Racine. Mr. R. I. Swift operates from that point. He handles both the electric business of Wisconsin Electric Power in Racine and the gas business of Wisconsin Gas and Electric Company and the remaining business in the territory called the Racine division of Wisconsin Gas and Electric Company. Mr. Swift is 42 years old and has been with the company for 18 years.

In Cudahy and South Milwaukee there is a gas distribu- 5126
tion system and in the Racine division there is one superintendent of what is called the Cudahy district. Mr. M. Martinson is the superintendent of that gas district. Mr. Martinson is 38 years old and he has been with the company for 20 years.

The largest division of the company is the Western division. The head office of the Western division is at Fort Atkinson. At that point Mr. W. D. Leonard directs all of the operations of the Western division. Mr. Leonard is 55 years old. He has been with Wisconsin Gas and Electric Company for 13 years and with the predecessor municipal 5127
system for a great many years prior to that time.

In the Western division are a number of districts and the first one of these is the Burlington district which is shown outlined in red, starting just to the west of the west line of the Kenosha division. The local superintendent in the Burlington district is Mr. F. Langley. Mr. Langley is 46

years old and has been with the company for 14 years. He lives in Burlington and I believe is acquainted with most all the people in the district. Mr. Langley, as a district man-

ager or superintendent, reports to Mr. Leonard, the division manager, and the district managers, in general, have about the same relation to their property as the division managers to theirs where there is no districts.

In the Burlington district you will see a small red circle way down near the state line. That is the location of the local agent and I shall tell you later more about what local agents do and at the present time merely indicate that they take care of the need of the customers in the districts in
5129 which they circulate.

The next district of the Burlington division, further west of the Burlington division, is the Whitewater district. The office of the Whitewater district is at Whitewater and Mr. H. F. Winnie is in charge. He is 44 years old and has been with the company for 26 years.

As we go along I shall point out that the location of these district offices is practically the same place that the only office that the predecessor companies had was located prior to the time that we acquired such companies as the Burlington Electric Light and Power Company and the White-
5130 water Electric Light Company.

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In the Whitewater district Mr. Winnie has one local agent. He operates out of the village of Palmyra where you will see a solid blue circle.

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The next district is the Fort Atkinson district, the headquarters of which are located at Fort Atkinson.

This district is under the supervision of Mr. E. E. Hein. Mr. Hein is 36 years old and has been with the Company for 12 years.

It is merely a circumstance and an appropriate one that Mr. Hein, the superintendent of the district, is at the same location as Mr. Leonard, the manager of the division.

The fourth district of the Western Division of Wisconsin Gas & Electric Company is known as the Watertown District, with head office at Watertown, under the direction of the district superintendent, Mr. E. T. Hornickle, who is 49 years old and has been with the Company for 22 years.

In Mr. Hornickle's district is a local agent at the village
of Lowell. 5132

That location is up in the northern part of the district which is outlined in green.

There is also a Waukesha District, consisting of the city of Waukesha and in charge of that district is Mr. L. V. Schivursky.

Mr. Schivursky is 41 years old, has been with the Company for 15 years.

Out of that office are directed the affairs of what was once the old Waukesha Gas & Electric Company.

In the case of Watertown just described, we have a local

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office, just as the old Watertown Gas & Electric Company had. That is possible where you service large areas out of one office.

Now we come to the Northern Division, and that is one of the typical divisions.

It has no districts, and for which reason there are a number of local agents.

I wish to describe to you, because it is typical, more of the detailed operations of this particular division. The division is in charge of Mr. W. E. Kuehlthau, who is 56 years of age.

5134 *Gould W. Van Derzee—By Respondents—Direct*

Mr. Kuehlthau has been with the Wisconsin Gas & Electric Company for eight years, and he was with the predecessor company, which we acquired, for 32 years. So he has been in the public utility business for 40 years.

Mr. Kuehlthau's headquarters are located at West Bend, which is the so-called division headquarters. At that point Mr. Kuehlthau has an assistant division manager by the name of C. P. Strodthoff.

Under Mr. Kuehlthau and Mr. Strodthoff are all of the
5135 operations of the Northern Division.

One of the principal divisions of the work in the Northern Division is that of the chief clerk—Mr. R. S. Kelley. Mr. Kelley has under him some nineteen employees—a senior clerk, one figurer, one general clerk, one cash poster, one

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machine biller, one addressograph operator, one balancer, one receiver, one prover, three credit and collection clerks, and two stenographers, one telephone operator, three meter readers and one stock checker.

That little group does practically everything that the Cus-
5136 tomers Accounts Division does in a large company. It takes care of all the operations, from meter reading to the collection of the bills for the entire district, except as it is necessary to make occasional check meter readings, and that is done by the local agent.

Then, under these two directors of the Northern Division, Messrs. Kuehlthau and Strodthoff, is a sales and promotion department, which operates as a unit.

In this sales and promotion department are seven service advisors, and this is the new form of service that has just recently been started in the Northern Division, and takes the place of the old sales representative plan.

These seven service advisors each have a district. They obtain new customers, answer rate or service complaints and inquiries, cooperate with dealers, demonstrate appliances, arrange and conduct group meetings of customers, sell merchandise, inventory customers' appliances, promote the use of service in all ways, attend sales office meetings as necessary, provide information for service connections.

If they happen to be in the field and are asked a question,

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"How can I get service?" they take care of if they are right 5138
there.

Then, in addition to those seven service advisors, there is one lighting advisor, who works with all of the salesmen. This lighting advisor cooperates with the service advisors, sells the better-lighting idea, prepares lighting and wiring lay-outs, lectures on lighting and better wiring, cooperates with contractors and architects.

There are also other employees in the sales and promotional division consisting of a customer servicer and demonstrator, who demonstrates appliances that have been sold
5139 in homes, and conducts group cooking meetings, and a customer servicer and demonstrator who attends to the display room care, keeps all service advisor records, prepares reports, issues and follows up routine sales department work to and from the advisors, assists in home or group demonstrations, arranges for delivery and installation of certain equipment which is sold.

Those ten individuals in the sales and promotional department are a unit in themselves, detached from the balance of the Company, except with respect to the furtherance of the general policies laid down by the home office.

They operate, in this Northern Division, just as if there
were no other connection with the outside world.

They take care of everything that should be taken care
of in the line of sales promotional work.

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The third division we come to, which is under the
direction of Messrs. Kuehlthau and Strodthoff, is that which
relates to the installation of service and the maintenance
thereof. There are two general foremen in this division, who
5141 report directly to the manager and assistant manager.

They in turn are responsible for an organization of 33
line foremen, linemen and ground men.

Of course, the number of that type of employees required
depends upon whether you are in an expansion period and it
is capable of being contracted; employees can be sent to
other divisions if work is slack in this division.

In addition to the line foremen, linemen and ground men,
there are six local agents.

These local agents carry out system operation as directed.
They receive trouble calls. They inspect weekly street light-
5142 ing system records.

They also inspect the systems. They inspect sub-stations
and large meters. They do collecting, supplementary meter
reading, complaint investigating, remove and install meters,
obtain change of name, set testing equipment, prepare orders
to do minor work, gather information as requested, do mis-
cellaneous appliance repair work, cooperate with service ad-
visor and above all cooperate with the customer on the job.

By turning to the map you will note that there is a local
agent at Elkhart Lake, where the solid red circle appears.

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There is another in the northwest corner of the territory at a place called Lomira, and another almost due east at Random Lake.

There is a fourth at Thiensville and still another at Menomonee Falls in the south central portion of the Northern Division.

In this general division of the Northern Division, which takes care of the installation of service and the maintenance thereof, there are also four trouble men, who are available
for use around the division—one appliance repair man, three 5144
meter testers, an engineering clerk who takes care of all the information necessary of an engineering nature, which may finally have to go to the home office for record purposes or approval of long line extensions by the general engineering department, one storekeeper, four storekeeper helpers, who do work of loading the variaus trucks and a substantial amount of other work, and one janitor.

So you see we have another complete section of operators in this division, which is completely capable of taking care of the requirements of service extension and the maintenance
thereof, entirely divorced, except that it has to follow the 5145
engineering principles laid down in connection with the construction of lines, and has to receive certain executive approval for expenditures over a certain amount.

That, generally, describes the skeleton organization of

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a division of Wisconsin Gas & Electric Company.

Now, we can come back to your question, "Do the local problems vary?"

There is no hard and fast rule about what is local. Perhaps the best way to state the matter is that things that are

done locally are the things that need doing locally, and I can assure you that they are done.

Perhaps we should go further in this description and pick out some small town and a customer therein that enables us to describe more definitely the problems of a local customer.

I mentioned to you a little village up in the northwestern part of the Northern Division, called Lomira. Lomira is a typical small city. There is a local agent located in it.

5147 It is a rural village on Highway 41, a stop on a railroad known as The Soo Line. It has some small industries. It is in a dairy center.

There is a brewery there, a small feed mill, a hatchery, a small sub-station of Wisconsin Gas & Electric Company.

The population in the 1930 census was 603. It is estimated now that the population has increased to 641. There are 258 customers.

The Lomira Electric Light & Power Company formerly operated there and was acquired by Wisconsin Gas & Electric Company at the end of 1917.

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I have given you the information with respect to that company. Mr. Schmidtman has given you details with respect to downward trend in rates that occurred in connection with a large number of small companies immediately upon acquisition, and the facts with respect to the village of Lomira are that a cost of 40 kilowatt-hours to the customer on the system of the old Lomira Electric Light & Power Company, before acquisition, was $4.83, and promptly after acquisition, was $2.74—a reduction of 43 per cent.

Now, we have a local agent at Lomira, and his name is Elmer Waechter.

He is 32 years old. He has been with the Company for 12 years, including the time that he spent with the predecessor company—Wisconsin Public Utility Company at West Bend. It just so happens that the manager of that division—Mr. Kuehlthau—had Elmer as one of his employees when the Wisconsin Public Utility Company was operating.

So those men have found important places in what has
long since ceased to be a relatively new order of things, 5150
under Wisconsin Gas & Electric Company, but they go along with substantially the same relations to each other.

Elmer has been in Lomira since September 1, 1933.

By Mr. Browning:

Q. He has been the agent there? A. And during that period he has been the local agent. —2,254—

(Discussion off the record.)

A. (Continuing) Mr. Waechter has charge, as a local agent,
of the operations of 2,111 customers in the area which he 5151
covers, being the area in and around Lomira.

The Examiner: We will have a short recess.

(Whereupon a short recess was taken.)

The Examiner: You may proceed.

By Mr. Browning:

Q. How does this local agent take care of the customers in Lomira? A. Well, suppose we do this by example, and that means we need to get a typical customer, and let's call

her the Widow Smith, or Mrs. Smith. The question is, What are Mrs. Smith's needs?

Assume Mrs. Smith applies for electric service, how does she get it? How does she find out about appliances? Whom does she contact in case of trouble? How does she get her bills and how does she pay them?

Well, Elmer is the answer to her prayer. Suppose that Mrs. Smith has never used electric service. She decides that it would be a nice thing to do away with the old-fashioned
5153 methods—oil lamps, coal ranges. She calls in Elmer, who has been there a long time, and takes him into her confidence.

—2,255—

Elmer finds out generally how much money she can spend for wiring and for appliances, and knowing that, he goes to work on the problem for her, because he is a joint maintenance and salesman looking out for the interests of the company. Under the new set-up with the service advisors, he asks the service advisors also to call on Mrs. Smith and corroborate his judgment and give her additional information which such service advisors have with them in catalogues and in their
5154 minds and that is done while Elmer is getting a wiring contractor to make a bid on the wiring.

Finally, after conferences with the service advisor, Mrs. Smith knows that she would like to have, say, an iron, washing machine, electric grill, good lighting throughout the house, small electric refrigerator, vacuum cleaner and miscellaneous things in accordance with her pocketbook.

The local wire man makes an estimate on the cost of the wiring and finally the wiring is installed. In the meantime, Elmer has made arrangements with the district office at West Bend and on the date that service is wanted, which is after

the wiring has been installed and has been officially accepted by state inspection, the line crew of the company appears on the scene in connection with a routed plan for the day of doing the necessary work.

Then they have work in Theresa, a few miles away and work in Lomira and work in some other point after they get through with Lomira. The work is routed and it is always

—2,256—

possible to have a sufficient amount of advance notice so that work can be routed sufficiently. 5156

In case of real trouble, Elmer is a line man and he can climb a pole and put in emergency service himself with a little help he can pick up around the village, but the whole philosophy of this divisional operation is to do things efficiently in places where they can be done effectively and cheaply so in this particular instance, the service comes from the line crew with headquarters at West Bend.

The meter is installed or can be installed by Elmer and we come to the point where a customer is all ready for service and there is nothing left to do except turn the switch. She has had made available to her services that are necessary in 5157
the proper selection of the type of apparatus she should get, the kind of wiring to be put in, without stirring outside of the village of Lomira.

If she doesn't want to buy an electric grill or washing machine without actually seeing a larger number of samples that can be found in the local store, arrangements are made frequently by the service advisors to take the parties in their automobiles back to West Bend but usually a customer can see something installed in another customer's premises and doesn't have to go very far.

He says, "I want one like that." Some time or other, Mrs.

—2,257—

Smith, after enjoying electric service, may have an outage. A fuse may blow in her home; something may happen due to a lightning storm that interrupts service. Now, how does she take care of that? Well, her first thought is of Elmer and she has Elmer's telephone number and she calls him and Elmer, being both educated as a trouble man and a line man is able to handle any minor trouble in the district.

5159 Of course, these troubles don't happen all at the same time. In case of very grave troubles due to an extensive sleet storm, then the entire resources of the divisional headquarters with all the trucks and the men are thrown into the work and service is restored practically as promptly as if that whole division was located at Lomira because with the hard concrete roads, there is very little travel time involved.

At least service is restored within all reasonable practical limits of time in which any customer could expect service to be restored and that is the test.

People are reasonable in those matters and their ideas of
5160 how quickly service should be restored are colored somewhat by the nature of the trouble that they can see visually.

Now, Mrs. Smith may have a complaint on her bill. The complaints are taken up to the service advisors that travel the territory or with the local agents and if it is necessary for the matter to be taken to the divisional office, that is taken care of entirely by these representatives who are local in the

—2,258—

field and Mrs. Smith does not have to go to West Bend in order to settle her complaints.

The bills are mailed out of West Bend to Mrs. Smith and she can make payment at a local station or she can put it in an envelope and send it back to West Bend headquarters. In other words, Mrs. Smith enjoys local management, because all the contacts she needs and that she makes are handled locally. Now, there are other matters that are best handled in the district office.

We have pointed out some of those. To enumerate, for example, in the northern district office, we have the complete organization that handles the customers' accounts. We have 5162
the organization that extends the lines and services them. We have the sales office that takes care of all of the needs around the community.

These matters are handled in the district office or divisional office, as we call it, where there are no districts for the entire division, because they can best be handled there. Mrs. Smith would gain no advantage from having these matters handled more expensively in Lomira which can be better and more economically handled for the entire division in West Bend.

Still other matters are handled in the home office at Ra- 5163
cine. All of such work as the general sales department, which lays down the sales policies which are handled in the field; all of the general accounting work on the books, for example,

as distinguished from customer service accounting is handled at the home office at Racine; all of the general engineering work is handled at the Racine office for all of the divisions —gas, electric, heating, and transportation—and the general executive offices are located there, and they service the requirements of all of the operating divisions and utilities.

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The result is, as we have pointed out in previous testimony, substantial economies by spreading the efforts of the executives, the engineering department, general office division, the sales policy-making division, over all of the company. Obviously, Mrs. Smith would gain no advantage from the standpoint of service or rates from having these matters handled locally at tremendously increased costs.

She is blissfully unaware of such problems as depreciation accounting, reactance and capacity effects on trans-
5165 mission lines and the cost of a 90-day bank loan at a local bank. These are matters, of course, which ultimately reflect in the cost of service and redound to her benefit, but she is paying in her electric service bill an element of cost to see that these things are done right and there is no reason why she should be concerned with them.

The fact is that they are handled there at Racine because they can best be handled there.

There are some other matters that are handled in Milwaukee. For example, the work of the operating research bureau which has been described in previous testimony at

5166 —2,260—

some length, which does work for all of the companies.

There is a real estate department of Wisconsin Electric Power Company which does work for Wisconsin Gas & Electric Company. I remember seeing an order go through not long ago, asking that the real estate department, which was familiar with real estate matters in the territory served by Wisconsin Electric Power Company in Port Washington, obtain a right-of-way through the City of Port Washington, so that a high voltage Wisconsin Gas & Electric Company line could be built through the city to the terminals of the

sub-station adjacent to the power plant in order to ge a new source of power.

The real estate department of Wisconsin Electric Power Company was capable of doing that work cheaper and better than any representatives of Wisconsin Gas & Electric Company. Hence, the old test, Where can things be done cheaper and better? is applied.

We have at Milwaukee, an executive officer known as the president of Wisconsin Gas & Electric Company. We have two other vice presidents who are in the category of general 5168
executive officers. They are available for consultation and the fact is that Wisconsin Gas & Electric Company could not afford to pay the full time services of such men and the fact that they are available for such consulting services and are used at relatively small cost, just adds up the benefits which Mrs. Smith gets in Lomira. —2,261—

I think it must be obvious that such services as are performed in Milwaukee better than they can be performed for Wisconsin Gas & Electric Company elsewhere can not possibly detract from the local character of the management in Lomira. 5169

Still other matters are best handled outside of Wisconsin. For example, boilers for power plants can not be bought in Wisconsin. Western cedar poles, which grow in Idaho and on the Pacific slopes, have to come from without the state. A flotation of large bond issues for the properties must originate in the East. We can not buy boilers in Lomira or sell large bond issues there, but this fact does not detract one whit from the effectiveness of Elmer's local management.

The test on all these things is no geographical test, but where the matter can best be handled. By "best" we mean

with maximum efficiency at lowest cost. This does not mean that the present arrangement is inflexible and final and not subject to change if and when changed conditions mean that something can be done better some other way at some other place.

On the contrary, we are always endeavoring to achieve important developments. We have an open mind. We can change our organization set-up any time

I like to look at a divisional organization of Wisconsin
5171 Gas & Electric Company as being the ideal arrangement that we have made of the services required for these little companies. We have set down a local management in Lomira

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where it is needed for their and surrounding territory. We have set down in West Bend the people who take care of the customer accounting business, the divisional sales offices, the men who take care of the extension of the lines and the maintenance of them, just as if he had the moulding of a new company in our hands. We can, in effect, mould it to our heart's desire by the mere change of the location of a local
5172 agent or a district office, and accomplish all of the things that are required for successful efficient service to the individual customer.

Both our customers' and our security holders' interests are to have such maximum efficiency at lowest cost. In the time that I have personally been with the property, since 1913, it has grown from an area of 305 square miles to 12,318 square miles, and the number of customers served has increased from 29,917 to 352,788.

The kilowatt hours sold to customers has increased from 62,732,315 kilowatt hours in 1913 to 1,317,564,313 kilowatt

hours per annum, but the problem is still essentially the same.

Where can the matter best be handled? That is our test. As my testimony shows, our history has been one of a combination of small companies, accompanied by improved service at lower cost.

We are, naturally, very proud of our results and we think

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that we have good reasons for so being.

There are a substantial number of pioneer developments 5174
in the public utility field for which our group has been responsible. I want to just recite a few of these and I can do it because most of these results are what has been accomplished by either the whole organization or somebody other than myself. I think I would mention first, among the real fundamental benefits that have accrued through the efforts of our people, the use of pulverized coal as adapted to the central station industry.

Not long ago, when I was taking through the East Wells Street power plant, formerly known as the old Oneida power plant, a group of men who were interested in last securities 5175
issued that we got out, I pointed out to them a boiler that we had saved which bore a legend indicating that it was the first boiler to be operated by pulverized fuel in the world.

John Anderson, a canny and efficient Scotch engineer, originally conceived the idea of applying powdered fuel to boilers in the central station industry. Prior to that time, it had been thought that the use of pulverized fuel would do all sorts of damaging things to the brick work and other parts of the boiler, that it just couldn't be done.

John was one of the types of individuals, of whom there are a lot in this country, who enjoy doing things that can't be done, and so he confided his hopes and aspirations to Mr.

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Way, and together they set their heads to work on the problem of pulverized fuel in the industry. The way they did that was to take an old boiler, the one I just referred to at the old Oneida Street power plant, and experiment, together with one of the manufacturers who made up various pieces
5177 of apparatus in accordance with their design, and to see what could be done. It was a long, long experiment, and about four years were used in the development of all the necessary auxiliaries required to pulverize the coal to the fineness of talcum powder, to blow it into the boilers and to ignite it and to have the heat pass through the boiler in the most efficient, effective manner so as not to destroy the brick work, so as not to form slag in the bottom of the boilers and so as to generally operate as a medium for the production of economical steam for power generation.

At the end of the war, you may recollect that there was
5178 a decided shortage in capacity of plants, business began to boom. With our company in particular we had to make a decision on short notice that a new plant had to be built; we had some four or more mortgages on the property of The Milwaukee Electric Railway & Light Company and we couldn't get the money from that source and finally the idea was developed of forming Wisconsin Electric Power Company to own the Lakeside Power Plant which in turn would be leased to The Milwaukee Electric Railway & Light Company.

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In connection with thoughts on that matter, Mr. Anderson and Mr. Way were giving a great deal of prayerful thought to whether or not they dared to risk putting up to the management of the company and the New York officers, the question of using powdered fuel in the new plant

They finally concluded that they should make such a recommendation, and one day there appeared at the New York office, Mr. John Anderson and Mr. S. B. Way, with the courage of their convictions and their recommendations that the
new plant should be a powdered fuel plant, and they virtual- 5180
ly staked their reputations and their jobs on the powdered fuel recommendation. I think it probably is putting it mildly to say that the men who heard them and who had not been close to this four years of experimentation were literally aghast that there was a new way and that they would recommend it to the extent that they did, but as time went on in the discussions, and it was shown that 20 per cent of the coal bill might be saved by this revolutionary process, the officers of the company in New York and The North American Company, which was really the one to risk its money, took the
venture with these men who were risking their reputations 5181
and their jobs, and said, "We will back it up financially," and that was an epoch-making decision for the utility industry of this country.

It has saved millions of dollars. The story of how the first extension of the Lakeside Plant was begun late in February

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and finished in December of the same year, bringing with it all of the new problems of design and the new form of burning coal, is an epoch-making action in itself.

The plant was finished within a year, it operated satisfactorily, and since that time the central station industry has made tremendous strides, has saved millions of dollars to the everlasting credit, courage and perseverance of John Anderson and S. B. Way and The North American Company which made the experiment possible by putting out the money.

Q. Mr. Van Derzee, I don't think you mentioned where John Anderson came from. Was he brought to Milwaukee
5183 from Union Electric Company of Missouri? A. Yes. John Anderson was an engineer. He and Mr. Way were friends. Mr. Way, as I previously described, had been brought by The North American Company to Milwaukee Electric Railway & Light Company in 1911 and it wasn't long after that that Mr. Way arranged, through The North American Company, to release John Anderson from his work in St. Louis.

There were other collateral problems in steam generation which followed over the year, new developments which also have been revolutionary. The first installation of high pressure steam, 1,200 pounds pressure, at the Lakeside Plant, in-
5184 volved a great many new experimental problems.

The boiler worked from the very first minute it was put on the line and it was the initial and largest high pressure

steam boiler to be first operated successfully.

There were some others that were being experimented with at the same time; they were smaller; and it was a matter of years in one instance, before such boilers were operated satisfactorily elsewhere.

The radiant superheater was a development that followed the development of powdered fuel, in which the walls of the

inside of the boiler can be lined in part with tubes carrying the steam and thus perform, by radiant heating of such tubes, the purposes of the superheater, and accomplish other functions of helping to maintain the boiler walls cool at the same time.

Some other developments in other fields include the three-truck train. That was an invention of Mr. Way, working with the engineers of rolling stock department. At that time, we had a number of single cars on the railway system that were getting old. Mr. Way's idea was that two of these cars 5186
would be reconstructed and rejuvenated and held together by a single truck in the center, and with a vestibule passage between the cars so that there would be large carrying capacity at the time of the peak loads.

(Discussion off the record.)

A. (Continuing) A great number of old cars that might otherwise have been put on the scrap heap were thus rejuvenated and the last of the two-car three-truck trains is just being disposed of. They have performed a very valuable service over a period of ten or fifteen years. 5187

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At the present time, as I have testified, we are gradually changing over the rail lines, as we have money, to trackless trolley lines or gas bus lines, as the case may be. That does not necessarily mean that we now have in mind that all of the lines will eventually be changed from street car service to bus service, but it is likely that many more will be and that there will be continuous change.

In other fields, we have developments of Hevi Duty Electric Company with which our sales department has been in

close contact, concerning which I testified at length a few days ago. One of these is the vertical carburizer, the metal alloy ten, and another alloy twenty, which I did not describe in my previous testimony, but which is now being developed by that company, in the hopes that it will replace the present type of nichrome wire and range units as a medium which will stand higher temperature and have longer life and be cheaper.

Not long before I left Milwaukee, Mr. Post, our vice
5189 president in charge of power, took up with me two developments which he thought ought to be patented that Mr. Dornbrook and the engineers had worked on.

We concluded that the ideas were probably patentable and that we should take out patents on them. These ideas relate to a new form of de-aerator, taking air out of boiler feed-water, and a new improvement on a certain type of valve for power plant work. —2,270—

I have passed over a long period of experimentation which finally resulted in the issuance of American and British patents on a process of taking out of coal, gas which
5190 could be used as an illuminating gas, various residuals which have by-product value, and powdered coke which would be the end result to be burned under the boilers instead of powdered coal.

Experimental models were built and tried and the patent has been kept on ice awaiting a time that it might be used advantageously.

There are many other developments and improvements which have been made by our engineers in various fields, working with manufacturers, which we have not sought to patent.

I remember one not long ago with respect to certain features of installing high pressure tubes in the boiler drum which we decided the manufacturer could patent if he would give us the right to use that improvement in design which we were really responsible for without the future royalties. This he readily agreed to.

Q. Will you tell us what is the Coffin Award? A. Probably the Coffin Award can best be described by giving the citation which Wisconsin Electric Power Company received
last June at the annual convention of the Edison Electric 5192
Institute covering performances in the year 1938:

> "The Prize Awards Committee administers the Charles A. Coffin Award and it is now my privilege
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>
> to announce the winner of the 1938 award.
>
> "This award, established in 1922 by the General Electric Company as a tribute to the memory of the late Charles A. Coffin, founder of that company and one of the great leaders in the electrical industry,
> each year goes to that company which has made a 5193
> distinguished contribution to the development of the electric light and power industries for the convenience of the public and the benefit of the industry.
>
> "The winning of this award is considered a very great honor and distinction and it is deservedly the most highly prized award for which electric utilities can compete. The Committee of Judges this year were confronted with an unusually difficult task because of the excellence of the exhibits submitted for the award and the strong claims which each of the

six contesting companies was able to put forward to warrant its selection as winner.

"In reviewing the presentations, the judges have been definitely impressed with the splendid evidence of diligence and capable efforts to bring about improvements in service and to contribute benefits both to the public and to the industry.

"It gives me pleasure to announce the unanimous decision of the judges, consisting of Dr. Carl T. Comp-
5195 ton, president of Massachusetts Institute of Technology, A. C. Marshall, vice president and general man-

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ager of Detroit-Edison Company, and your chairman of the Prize Awards Committee, which, for outstanding accomplishments during the year 1938, awards the Charles A. Coffin medal to the Wisconsin Electric Power Company.

"This company has made distinguished contributions to the technical development of this industry in efficiency, power generation and in power sales to
5196 the public.

"In 1938, Wisconsin Electric Power Company's combined generating plants produced electric energy at the remarkably low yearly average of 13,677 B. t. u. per kilowatt hour, and the yearly average for its low cost Port Washington generating station was only 10,788 B. t. u. per kilowatt hour, a world's record for this class of station.

"Efficiency in handling customers' accounts from meter reading to collecting has enabled the company to reduce the cost per bill to a remarkably low level.

"The company's record in the sale of power for industrial, commercial, domestic, and rural purposes, is outstanding. It has achieved most effective and satisfactory cooperation with dealers in electrical merchandise. The company has established good relations with the public, it has built up good employee relations and placed them on a sound basis. It has achieved an excellent safety record with no fatal accidents in a period of five years.

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"In 1938, the company effected a reorganization and refinancing plan which has placed it in a strong financial position and materially reduced its fixed charges. The public which this company serves has benefited greatly and will continue to benefit from its achievements.

"The industry likewise has benefited and will continue to do so."

The individual who is being quoted as delivering this citation and who was the third member of the committee 5199
was Mr. Liversidge, chairman of the Prize Awards Committee of the Edison Electric Institute Convention and president of the Philadelphia Electric Company.

It so happens that the receipt of the Coffin Award by one of our three companies was not the first time that our Wisconsin-Michigan group had been so honored. Prior to the time that the separation of the companies was made and the former Milwaukee Electric Railway & Light Company was in existence, that company received the companion award to the electric award from the American Transit Association for

the same type of performance in the interests of the public in the transportation field.

Mr. Browning: Read the last answer please.

(Whereupon, the above recorded answer was read by the reporter.)

The Witness: Thus Wisconsin Electric Power Company and its predecessor constitute the only company

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5201 that has ever received the two awards.

By Mr. Browning:

Q. Has your group of companies received a further award while you have been testifying here? A. Yes. During the past week, the American Transit Association met at its annual convention and The Milwaukee Electric Railway & Transport Company received an award made by the Transit Journal.

The plaque which it received as evidence of this award reads as follows:

5202 "Maintenance award presented to The Milwaukee Electric Railway & Transport Company for its contribution to the improvement of maintenance policies in the transportation industry through participation in the Transit Journal maintenance contest of 1940.

Mr. Browning: This is a good stopping point.

The Examiner: Very well, we will recess until 2:00 o'clock.

(Whereupon, at 12:30 o'clock p. m., the hearing recessed until 2:00 o'clock p. m., the same day.)

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AFTERNOON SESSION

The Examiner: Let us resume.

Whereupon, GOULD W. VAN DERZEE resumed the stand and testified further as follows:

Direct Examination by Mr. Browning (Continued):

Q. You outlined this morning, in some detail, the principles and methods which you apply with respect to local 5204 management in the case of Wisconsin Gas and Electric Company. Are the same general principles and methods applied in the cases of Wisconsin Electric Power Company and Wisconsin Michigan Power Company? A. Yes, the same underlying principles apply. The actual operations differ somewhat. Wisconsin Michigan Power Company is more like Wisconsin Gas and Electric Company in its divisional operations. Wisconsin Electric Power Company is somewhat more compact but even that company has a large number of local agents who perform the same general character of work for customers as do the local agents in Wisconsin Gas and Elec- 5205 tric Company territory.

Q. You adapt the general principles to particular factual situations? A. We do. Always our endeavor is to do best locally what can best be done locally.

Q. Has The North American Company been of any assistance to your companies in their management problems? A.

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Yes, The North American Company has been of great assistance to our companies down through the years. With respect to financing matters we have always had at our disposal the

services of The North American staff. In financing we have availed ourselves completely of such service.

The North American officers have not only followed security markets and developments for us, but have usually planned and carried out most of our financing on down through the years. While we have helped from time to time locally, we do not pretend to keep in Milwaukee a financial staff such as The North American Company has.

There is only one Mr. Fogarty, only one Mr. Freeman,
5207 only one Mr. Piske, and only one of a number of other people who are skilled and have a high reputation in financial work in the New York office.

Q. Would the maintenance of a comparable financial staff in Milwaukee involve any additional expense to your companies? A. Well, obviously to maintain such a financial staff in Milwaukee would involve large additional expense because this field is a highly technical field. On account of the situation which has prevailed we therefore enjoy a considerable saving each year and the result is, as I testified recently, that the officers are free to do ~~more~~ on various
5208 operating properties and perhaps that has had something to do with the great technical developments that have resulted.

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Personally, I am only the general manager. I don't pretend to be an expert in general financial matters. If we were to set up a financial staff in Milwaukee we would not keep it busy on financial matters because we don't have enough of such problems.

I would like to give you one example of North American aid to us in financing and that relates to the Wisconsin Michigan Power Company merger in financing in 1927. I would

like to give this in detail because only by going through some of the details of a typical job of financing can a full appreciation be gained of just what help The North American Company has been on down through the years.

Mr. Buswell: What was the date of this financing?

The Witness: 1927.

The North American officers have developed and directed the program which resulted in the combination of the properties of 12 small companies with two
larger companies in Wisconsin, and the upper peninsula of Michigan, the elimination of 13 of those corporate entities, leaving one financially stronger company, namely the Wisconsin Michigan Power Company. 5210

The power generating and transmission system owned by Wisconsin Michigan Power Company, upon consummation of the plan, was connected with the system of the Wisconsin Gas and Electric Company, and The Milwaukee Electric Railway and Light Company to the south, providing the exchange of power

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which has already been described.

To the many problems involved in effecting this desirable reorganization, questions of State laws, mortgage liens, elimination of outstanding preferred stock, transfer of assets and franchises and assumption of liabilities, merger of certain of the companies, creation of senior and junior security financing media; to all of these and others the answers were found by The North American Company.

5212 The plan as finally developed involved the acquisition by Peninsular Power Company of all the property, assets and franchises of six Michigan corporations operating electric utilities in the northern peninsula of Michigan, certain water power property on the Menominee River, known as Pemene Dam site, owned by Wisconsin Gas and Electric Company; a certain sub-station and adjacent property at Appleton, owned by Wisconsin General Railway, and certain property
5213 owned by Utility Realty Corporation; the merger by Peninsular Power Company of five Wisconsin corporations owning and operating electric utilities, utility property or water power property in Wisconsin, the creation of a new mortgage and the issuance thereunder of $5,000,000 of bonds, the issuance of $1,275,000 par value of six per cent. preferred stock, and $5,225,000 par value of common stock, of which $1,200,000 par value was exchanged for common stock then outstanding and owned by the holding company;

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5214 the merger of Wisconsin Traction, Light, Heat and Power Company, a Wisconsin Corporation owning and operating an extensive electric utility in the Fox River valley, and an electric railway system in and about Appleton.

The major companies in the group were two Wisconsin companies, Peninsular Power Company with total assets as of December 31, 1926, of over $6,800,000, and Wisconsin Traction, Light, Heat and Power Company, with total assets of over $9,300,000.

Peninsular Power Company had no funded debt outstanding except $200,000, principal amount of eight per cent. serial notes, its $471,000 of outstanding bonds having been retired in November, 1926. It had $1,650,000 par value of seven per cent. preferred stock and $1,200,000 par value of common stock outstanding.

Under the plant, the charter of Peninsular Power Company was amended to provide for $13,000,000 par
value of stock, of which $6,000,000 par value was pre- 5216
ferred stock issuable in series, and $7,000,000 par value of common stock.

The name of the company was changed to Wisconsin Michigan Power Company. Creation of this serial preferred stock provided a junior security financing medium which enabled the company to provide its financing requirements from that source from time to time.

Wisconsin Traction, Light, Heat and Power Company had outstanding $3,000,000 principal amount of

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first mortgage bonds due July 1, 1931, of which $1,500,000 bore five per cent. and $1,500,000 bore seven and one-half per cent. interest, in addition to its outstanding stock, all of which was acquired in part from the North American Edison Company by the Peninsular Power Company prior to merger.

Attention had been given by the officers of North American and officers of its Wisconsin subsidiaries for considerable time to the general situation from the end of 1925. A preliminary plan had contem-

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plated acquisition of Wisconsin Traction, Light, Heat and Power Company by Wisconsin Gas and Electric Company.

In 1926 plans were prepared and several times revised, looking towards the merger of Wisconsin Traction, Light, Heat and Power Company by Peninsular Power Company. The major obstacle to any such merger was the existence of the Traction Company's mortgage, since it was felt by counsel that the
5219 lien of that mortgage might extend to the property of any company with which the Traction Company might be merged.

Because of the ten per cent. redemption premium on the Traction Company's bonds and the necessity of paying the additional interest on coupons to maturity, redemption of those bonds and the satisfaction of the mortgage were out of the question. After careful consideration it was concluded that a new first mortgage should be created for the Power Company prior to

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5220 the merger.

Numerous intricate problems arose in effecting the consolidation of the companies involved. Under the State laws, Michigan corporations could not be merged with Wisconsin corporations. Accordingly, it was arranged to have Wisconsin Michigan Power Company acquire all of the property, assets and franchises of the Michigan corporations and assume their liabilities. The ownership of the stocks of the Wisconsin corporations was vested in Wisconsin Michigan Power Company.

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Many questions of mortgage, bond and preferred stock redemption, franchises, etc., of the various companies, were sucessfully solved after many months of careful planning and intensive work.

The holding company not only assisted in the solution of these questions but also assisted in the acquisition of some of the companies. A new mortgage was developed by the North American officers with counsel and reviewed by the Wisconsin Companies' officers and counsel. 5222

In addition to many general improvements over the Power and Traction Company's previous mortgages, such as being an open-end mortgage and mortgage providing for the issuance of bonds in series, it hurdled the problem arising from the existence of the Traction Company as a separate corporate entity and the spreading of the lien of that company's mortgage to the Power Company's property by including a covenant of the Power Company, within six months, to

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merge the Traction Company or acquire substantially all of its assets and thereupon to convey to the new mortgage trustee the Traction property in accordance with a supplemental indenture, the form of which was stipulated when the mortgage was executed. 5223

The property owned by the Traction Company on June 14, 1927, so to be conveyed, was also specifically excluded from the term "property additions" as a further protection to bond holders, so that no additional bonds would be issued against that property,

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and provision was made that the Traction Company mortgage was not deemed to be an underlying mortgage until the Power Company should have conveyed the Traction Company property to the trustee of the new mortgage as above provided.

Certain property of Wisconsin Traction, Light, Heat and Power Company, on which a power plant of the Company was located, was not owned but was used pursuant to long-term lease with the Green Bay
5225 and Mississippi Canal Company. These leases were assigned to Wisconsin Michigan Power Company and then conveyed to the trustee of the new mortgage as further security for the bonds.

While the recording of a mortgage in public offices is normally a routine matter, the recording of the new mortgage and the supplemental indenture was a matter in which time was the essence. Counsel had advised that in order to avoid any question as to the lien

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of the Traction Company mortgage applying to the
5226 properties of the Power Company prior to the lien of its new mortgage, the new mortgage should be filed for record wherever necessary before the merger of the Traction Company had been effected.

Because of the softening of the bond market with the possibility of still further softening, because of the large amount of then recent security issues still undigested, the investment bankers wished to offer the new bonds at the earliest possible date in order to maintain the price agreed upon for their offering

to the public. If the offering had been postponed to a time which would make it impossible to sell the bonds at that price, because of market conditions, it would have been necessary to re-trade the price with the bankers or postpone the offering until the market would take the bonds at the original price, which was 99.

(Discussion off the record.)

A. (Continuing) It was necessary that the merger of all of 5228
the other properties be effected and properly recorded before the Traction Company was merged. Then that Company had to be merged and some more recording done, all preparatory to formal delivery of the bonds required to help finance the re-organization. Everything was in a hurry. The holding company did its part and the operating company finished the job.

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The time schedule was laid out by the North American officers and through minute men cooperation of the Wiscon-
sin staff was successfully carried out in spite of the fact 5229
that ten counties in Wisconsin, in addition to the office of the Secretary of State, and five counties in Michigan, were involved and the Recorder's offices in the various counties were at remote and inaccessible points.

The mortgage and supplemental indenture were signed on behalf of the Company and the trustee in New York, on Saturday, June 25. That was in 1927.

The Holding Company dispatched 22 counterparts by messenger on a fast train. Within a minute after his

arrival in Milwaukee at 12:30 p. m., Sunday, June 26, men were speeding to the far-flung points with the result that the documents were received for record on June 27 at 8:00 a. m. in Oconto County, at 8:02 a: m. in Winnebago County, and had been received in all of the Wisconsin counties by shortly after 11:00 a. m.

A Directors' meeting was then held in Milwaukee to merge the Traction Company with the Power Company and a certificate of merger, recording such action, was rushed
5231 to Madison and filed with the Secretary of State. Promptly thereafter an additional supplemental indenture conveying the Traction Company property to the new mortgage trustee was executed in New York and rushed out to Lansing, Michigan, where it was required at a hearing to determine

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the Michigan State mortgage tax before 10:00 a. m. on Wednesday, June 29.

After the hearing they were sped to Milwaukee and on to the County offices for recording.

The Holding Company had notably developed the plan of
5232 financing and advanced $7,800,000 to the Power Company and the Traction Company to enable the acquisition of the various properties involved and the redemption of the Power Company's preferred stock, and payment of certain of its indebtedness, but in order that the Power Company might have the benefit of issuing and selling $5,000,000 of its new bonds prior to an acquisition of the assets of the Traction Company, the Holding Company, North American Edison Company purchased the bonds forthwith and agreed with the investment bankers to resell the bonds to them at the same price after the acquisition of the Traction Company's

assets, the bankers being willing to buy at that price only after those assets had been acquired.

Under the mortgage covenant above referred to, the Power Company was required to acquire those assets within six months. However, under the time schedule worked out in New York, the merger was successfully consummated within two days after the mortgage was executed and within 10 days thereafter the bonds had been delivered to the investment bankers.

In furtherance of the improved financial structure of 5234

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the Wisconsin Michigan Power Company, the plan also involved the creation of serial preferred stock, of which $1,275,000 par value of six per cent. series was purchased by the Holding Company, North American Edison Company, at par.

The serial preferred stock created by charter amendment in June of 1927, of which $6,000,000 par value was authorized by the amendment, provided a junior security financing medium which was effectively used for a long period of years. 5235

By Mr. Browning:

Q. Do your companies have any contacts with North American Executives on matters other than financing? A. Yes, they do. We are in constant contact and consultation with North American Company Executives. Some examples of which—a few may have been previously recited—include the recent and extensive conversations in New York concerning the advisability of Wisconsin Electric Power Com-

pany proceeding to plan on 80,000 kilowatts of additional generating capacity.

We have had recent discussions on budgets and other accounting matters, on purchasing policies, and just at the present time conversations are going on with respect to handling problems that arise out of the Selective Service Act.

There are innumerable contacts of various kinds on all the phases of the business between the officers of our companies and the North American Company. Sometimes we
5237 get special help from them. The best instance of that is the time that Mr. Doolittle spent a number of months in Milwaukee about the year 1925 working on the so-called service

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at cost contract.

That contract was an arrangement which was to be voted on at the referendum under which the voters would decide whether the city should make a contract with the Company covering service at costs. Mr. Doolittle has also been out with us on other occasions. One that I remember at which he
5238 stayed several days was early in 1938 when he acted as our witness in a hearing before the Public Service Commission on depreciation methods.

Q. Do your companies have contacts with other North American subsidiaries? A. Yes, we have direct contacts with other North American Company subsidiaries. We get general help from the pooling of technical information. One of the ways is through the inter-company committees, the Electrical Committee, Station Advisory Committee, the Accounting Committee, and the Committee of Purchasing Agents.

Q. Could you give us some examples of help which your companies have received through such sources? A. The experience of the other North American companies, that is, subsidiaries, has been valuable in connection with contemplated employment of outside forces for inspection and maintenance work. A few years ago when we were seriously considering employing a certain firm for bushing testing work on our sys-

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tem, we were influenced against contracting for such services
by experiences of other companies with the same organiza- 5240
tion. Instead, we acquired equipment and assigned one of our own employees to testing work. We feel that the work being done with our own organization is effectively meeting operating requirements and the estimated savings is approximately $1500 per year.

Obviously this information we received was highly confidential and could only have been obtained from companies with which we were very closely associated.

As a result of inquiry on types of load-limiting resistors employed by other companies in starting rotary converters
and the receipt of information from Cleveland regarding a 5241
satisfactory load-limiting resistor constructed in their own shops, we undertook the construction of such limiting load resistors with the result that we saved approximately $20,000 on one of them and we have since constructed five.

A load-limiting resistor is a device consisting principally of resistance which is a necessary adjunct to a rotary converter if there is no battery connected with the system. When you have a rotary converter starting with no load and you endeavor to take load quickly without a load-limiting resistor, you get a flash-over in the rotary.

5242 *Gould W. Van Derzee—By Respondents—Direct*

The other companies have been of service to us in connection with extensive studies made from time to time on practices relative to reconditioning of transformer oil. Confidential information from other companies deterred us from installation of an activated alumina process for reclaiming and reducing acid content of transformer oil.

Figures on economies, which we compiled, suggested that if the equipment would function satisfactorily as claims made for it, we would be justified in making an investment of about
5243 $8,000.00 for the installation.

Due to the reporting unsatisfactory functioning of the process, where it was tried out in St. Louis, we did not go ahead with our proposed recommendations.

St. Louis' experience indicated that activated alumina process for reducing oil, acidity, gave good results for newly conditioned oil, but that after a few weeks in actual service, such conditioned oil showed a marked tendency to return to its original acid content.

As a result of experience of the various companies regarding frequency of inspection on certain construction practices
5244 on fault bus systems, we were prompted to make a detailed inspection of our own fault bus system at Lakeside. As a result of this inspection, certain connections and practices were discovered and changes made to improve the protection. These corrections eliminated possible failure of the fault bus

system to function as intended, with possible extensive damage to equipment.

The fault bus system is a general arrangement whose primary object is to trip out certain switches faster than they

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might ordinarily trip out with another kind of trouble due to their delayed action timing.

Studies are sometimes prepared, incorporating the experience of all companies on certain matters. One such subject was Diesel power which was assembled by the Cleveland Electric Illuminating Company. Two reports were made entitled, "Diesel Engine Power Costs," and "Package Diesel Engine Costs."

Copies of these reports were turned over to our power sales department for use in competing with Diesel power. St. 5246
Louis developed a method of cleaning turbine blading with dry pulverized fuel, ash and air. This method does a very good job of cleaning turbine blading, being by far superior to sand blasting, as it does not mar or scratch the metal, but it creates a very unpleasant dust condition.

Milwaukee took the matter up at that point and experimented further by using water, pulverized fuel, ash and air. This was done by mixing the water and the pulverized fuel ash, in a tank by means of a mechanical agitator, thereby keeping the ash in suspension and then feeding this mixture into an air gun, and blowing it onto the surface of the turbine 5247
blades. Use of this method by the different companies brought further improvement.

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Instead of a mechanical agitator, the air used is first blown through the tank containing the ash and the water, causing an agitation, and then feeding the complete mixture of water, ash and air to the nozzle used in spraying against the turbine blade.

All companies experience trouble with pulverized fuel in storage bins, becoming in a muddy state due to condensa-

tion taking place. This caused clogging of feeders, thereby reducing boiler capacity. It also caused corrosion of steel-work on the bunkers.

We found, on inspection of our own bunkers, that there was one of the main roof girders that was becoming quite seriously corroded on account of the moisture that had condensed in the pulverized fuel bin adjacent to this steel girder.

Cleveland devised a method that remedied this condition by insulating the bins. We, therefore, lined several of our
5249 bins with insulation, conducting tests, and from the result obtained from this have lined all of our pulverized fuel bins at Lakeside.

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When the capacity of the roll type pulverizer mill is reduced by reason of the feed to the mill being reduced, there is a tendency of the rolls to strike the grinding ring creating a metal-to-metal contact.

Mr. Browning: Will you please read that last?

(Whereupon, the above recorded answer was
5250 read by the reporter.)

The Witness: You see, here is what happens, and I am illustrating with my hands. There is a grinding ring inside of the pulverizer mill and a set of rolls comes along on the inside and rolls on the interior grinding surface and powdered coal comes down between. (Indicating)

When there isn't very much powdered coal, I am trying to say that the roll impinges on the ring and obviously tends to wear it out and what the boys did was to get together on some form of restraining har-

ness which would keep the roll back at a time when there was not much of the pulverized coal flowing down to the ground and thus prevent the wear.

By Mr. Browning:

Q. You developed the solution for that difficulty in Milwaukee? A. Yes.

Q. And passed it on to the other subsidiaries? A. Yes. Recently, Potomac Electric Power Company orginated the plan of flow controls for contact heaters at the Buzzard 5252

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Point Station. This is a different set-up than we have in any of our high pressure stations in that the heaters are tray type instead of tube type.

This diagram has been turned over to our engineering division to determine what advantages it might have over our installations and also what disadvantages there are in an installation of this kind.

These contact heaters are trays of feed-water, which comes in contact with live steam, whereas the ones that we are using are tubes with the water inside and the steam 5253
flowing over the outside. This diagram referred to relates to the method of controlling the flow of the steam over the water and there may be a good deal in it and we are trying to find that out.

Q. Will you tell us something about the accounting committee? A. About two months ago, or perhaps a little longer, the so-called budget sub-committee of the accounting committee of the subsidiaries of North American Company met in Milwaukee. Mr. John Dockendorf is the chairman

5254 of the sub-committee and the general purpose of this committee meeting in Milwaukee as distinguished from meeting in one of the other properties was because Milwaukee has probably gone a little further than some of the other companies in its method of budget control.

I was very much interested in the meeting and am always much interested in budget control work, so I was asked to

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5255 address the meeting at its opening and I spent about three-quarters of an hour talking to the assembled group on the working functions of a budget, how you can really control the business, how the budgets ought to be devised, going down the line as far as possible, getting everybody interested in them, passing on the ideas up the line.

I think that a great deal of value is coming out of more intensive budget work. I mention this budget committee because I happen to have been present at it myself and because it is only one phase of the work which is being done by the accounting committee.

5256 On September 16, the entire committee known as the accounting committee, also met in Milwaukee and I had the pleasure of attending that meeting. There were present at the meeting Mr. A. H. Shettler, controller, Union Electric Company of Missouri; R. H. Smith, controller, Cleveland Electric Power Company.

Q. What is that name? Shouldn't that read Cleveland Electric Illuminating Company? A. Here it says Cleveland Electric Power Company. That is'nt right though.

Q. What company is it?

The Examiner: You intended to say "Illuminating Company" instead of "Electric Company"?

The Witness: Cleveland Electric Illuminating Company.

A. (Continuing) H. G. Haydon, controller, Electric Power

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Company; J. H. Keys, controller, Illinois-Iowa Power Company; F. M. Bocher, assistant treasurer, Kansas Power &
Company; J. H. Keys, controller, Illinois-Iowa Power Com- 5258
pany; F. M. Bocher, assistant treasurer, Kansas Power & Light Company; A. J. Bohl, controller, Wisconsin Electric Power Company; Linda Hollenbeck, chief accountant, Wisconsin Michigan Power Company; John Dockendorf, assistant research engineer, Wisconsin Electric Power Company, and also representing Wisconsin Gas & Electric Company of which he is an employee.

I think it is important to give you an idea of the subjects which were covered at this meeting. There were operating and construction budget discussions. The progress to
date on the 1941 budget was gone into. The present plans of 5259
the subsidiaries are to make budgets for an entire year ahead.

We are now preparing those budgets for the year 1941.

The question of budget forms was also discussed. In that connection, there was conversation concerning the use of estimates of the Federal Reserve Index. The Federal Reserve Board Index is an index of industrial activity.

You hear it expressed as 120 or 124 or some other figure, which is issued by the Board and depends upon the industrial activity that has prevailed in accordance with the formula of the Board during the past month.

Several of the companies among the subsidiaries have very substantial amounts of industrial power and the use of industrial power varies quite generally with industrial activity. Hence, it is important that in preparing budgets for the future we have some idea from experts on what the Federal

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Reserve Board Index of Industrial Activity is likely to be, so we have obtained what we consider good counsel in that respect and it is the plan of the various companies to use a
5261 more or less uniform index of industrial activity in computing the estimated sales of industriai power in the budgets for the year 1941. There are, of course, situations peculiar to individual locations which may bring about a lag in business activity compared with a national boom, and those conditions are taken into account in applying the index to budget estimating in individual situations.

The subject of internal audits was discussed and under this heading the progress on organization of audit staffs was stressed. The audit staffs are being bolstered. Development of the audit program came in for considerable discussion and
5262 in this connection, the so-called flow diagrams or write-ups of departmental procedure were discussed.

Those are not the ordinary types of write-ups. Each department in each one of the companies is endeavoring to lay down these flow diagrams, the purpose of which is to chart the course of each financial transaction that originates in a department and which finally winds up on the books of the corporation, and when all of these are done, the so-called flow diagram descriptions will be used to see at what points audit work is necessary from time to time to best head off or catch any possibility of things going wrong.

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Another topic of discussion was the form of the president's monthly report to the Board of Directors, some details of which I have previously testified concerning.

Excess profits tax is another subject which was discussed, under the general headings "Necessity for Making Early Estimates," "Invested Capital Problems," "Desirability of having a Committee of Company Tax Experts meet to discuss the Problems," "Need for viewing every capital transaction in the light of the new tax law."

Then construction overheads were discussed and the prog- 5264
ress on the study of these overheads was enumerated by the different representatives.

There is a great variety of ways of handling construction overheads. What should interest during construction be? How should the general undistributed expense of the corporation be apportioned to capital monthly? And what items in the general undistributed groups should be used?

It is an important and helpful matter to have the counsel of all these representatives who are working on the same problems from different angles.

Then, customers' accounting and collection expenses were 5265
reviewed. Since that subject first came up in an accounting meeting at which the system at Milwaukee was discussed, we have had several visits from a number of the different companies endeavoring to find out just what the process is. That

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was described in the Coffin Award.

Sales promotion and general administrative expenses came in for their share of discussion to point out the differences in the costs of these groups of expenses between the different companies.

5266 *Gould W. Van Derzee—By Respondents—Direct*

Sometimes you think you are going along all right and that your expenses are at the proper level. When you come in contact with other companies that are doing about the same things and find that they do them cheaper and perhaps better, that is the time to look around.

The additional items which were up before the meeting, but which were not all of them wholly discussed to completion, were apportionment of stores to transportation expenses, reserve for extraordinary maintenance, spread of
5267 vacation expenses, handling of scrap materials, effect of selective service act on accounting organizations.

One of the interesting items in there is the spread of vacation expenses. We have been doing that in Milwaukee for a long time and it avoids having any large expenses on account of paying for vacations when there is no work done by our people during the summer time and each month there is a part of that yearly vacation expense that these men are allowed spread over the direct labor as an overhead.

I was particularly interested in the meeting of the accounting committee which I have just described and I made
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a point of talking to the representatives of each company.

I was very much impressed with the effectiveness of the meeting. While most, if not all of these companies attended other meetings of accounting organizations and societies, the great advantage of this kind of meeting is that each one is much interested in each other's topic, and each one has a chance to discuss the topic to a conclusion.

Questions can be asked freely and are answered without reticence. This is a far different thing from a formal society

meeting where some formal papers are read to a much larger audience, with limited discussion and far less opportunity to question the speaker or to exchange detailed information as to current practices.

At the formal society meeting, much of the time is spent in listening to details which are interesting more to the speaker than to one's self, unless it just happens to click with the subject that you are very much interested in.

You have all been to meetings of that kind and you know
that is a fact. One might attend meetings of professional 5270
accounting societies for a number of years and not cover even casually all the subjects that we discussed in two or three days of the meeting of the inter-company accounting committee which I have just described.

The value of such an inter-company meeting should be apparent when one realizes that here is that rarest of op-

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portunities, the opportunity to sit down for an extended period and talk shop with the fellows who are doing the identical work in companies with the same problems and all
interested in directing their attention to the same subject at 5271
the same time and to reach a conclusion.

There is no doubt that there is always inertia operating against a change in methods and procedures. It is always easier to follow the old way and to think it is best. If the opportunity is not present where a man is matching his own methods against those of other competent experts, he is likely to not make changes to more logical or economical methods. The fundamental thing which makes all this possible is, of course, the community of financial interest and

the fact that it is a common stockholder who is suggesting that we discuss methods and procedures with the other companies.

No company is going to disregard a suggestion made by its principal stockholder. Whether or not the suggestion is ultimately accepted the subsidiary is certainly going to study the question thoroughly before reaching its decision and not pass it off as it might in the case of the same suggestion being made by some disinterested third party.

5273 I have given only a few examples, but we have received assistance in many other such operating questions. The result of such committee activities is to make available to each company in The North American System the experience,

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knowledge and ability of the engineering and operating staffs of all companies. It would be out of the question for any one company to maintain a separate or outside engineering staff comparable to this.

Q. Have you visited another subsidiary? A. Mr. Coffin, now our vice president in charge of sales, and then the sales
5274 manager, and I and Mr. LaPorte in charge of customers' accounts in 1927 visited the Union Electric Light——

(Discussion off the record.)

Mr. Binford: I object to any prompting of the witness as to the correct name of the company.

Mr. Browning: Mr. Examiner, may we call for the Commission's Exhibit which shows the corporate charts?

The Examiner: Yes.

Mr. Hamilton: Are we off the record?

The Examiner: Off the record now.

(Discussion off the record.)

The Examiner: Let the record show that that chart is produced. Now go ahead, Mr. Browning.

Mr. Browning: I would like for the witness to complete his answer.

The Witness: I would like to add to my incom-
pleted sentence, where I hesitated to recollect the 5276
name of the company I visited, the words, "& Power
Company."

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Mr. Binford: Mr. Examiner, with respect to my last previous objection, I wish to withdraw any objection to the prompting by counsel for Respondents of the witness in respect to the names of these affiliated companies, but, of course, where such prompting is done, I will request that it appear of record that it is done.

The Examiner: Off the record now. 5277

(Discussion off the record.)

Mr. Browning: I would like the record to show that all I was endeavoring to do was to verify whether the exact corporate name was being used correctly and simply in the interests of greater accuracy in the record and I submit, Mr. Examiner, that nothing is to be gained by minor errors in the names of companies.

The Examiner: Well, let's go ahead and try to get along.

5278

By Mr. Browning:

Q. The company which you were describing owned the property now owned by Union Electric Company of Missouri and was the subsidiary of The North American Company at that time? A. Yes. The interesting thing about the visit to St. Louis to see Mr. C. E. Michel, sales manager, and the accounting people, was that we had been informed that St. Louis had the lowest customer accounting costs on the system.

5279 Hence, we wanted to find out just what caused these low customer accounting costs. We had a very pleasant stay there, as I recollect, and gained considerable information on

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St. Louis methods with respect to customer billing and also with respect to sales matters.

A commentary on this situation is that just about the week before I left to come to Washington on this trip, St. Louis was up to our office, having heard about the Coffin Award and knowing about our accounting results, to see how we got that way.

5280 Q. Could you give us another example of such a visit? A. Mr. Schmidtman went to Cleveland in 1934, for three weeks on the municipal plant situation. A number of articles had appeared in one of the Milwaukee papers which we didn't think were quite correct concerning the matter of the Cleveland plant and we wanted to get at the facts.

We were received in Cleveland in very fine style and were given a great deal of information which was more or less confidential to the company with respect to the affairs of the municipal plant.

Q. Have you borrowed personnel from another North American subsidiary? A. We have. The management of The Milwaukee Electric Railway & Light Company, in planning its promotional activities at the beginning of 1919, had decided that it would be a great benefit to its electric service customers and a substantial help to its load-building program, if it modernized its merchandise sales quarters and facilities

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for the merchandising of electrical appliances, portable
lamps and other equipment, and engaged in a somewhat 5282
broader merchandising program.

The Milwaukee company needed some expert counsel in this undertaking and inasmuch as the Union Electric Light & Power Company of St. Louis had a merchandising manager of broad experience and reputation, who had successfully achieved and expanded the merchandising program of that company, arrangements were made through the offices of The North American Company for the St. Louis company to loan the services of its merchandising manager to the Milwaukee company on a part-time basis.

The manager of the merchandising department of the 5283
Union Electric Light & Power Company, therefore, visited Milwaukee early in 1919 and made a complete survey of the merchandising operations of the Milwaukee Company.

The results of this investigation included the recommendation that the merchandising quarters of the Milwaukee Company be rebuilt at an initial cost of approximately $50,000.00 and that a comprehensive program be adopted for the merchandising of electrical appliances and portable lamps.

Previous to this survey, the entire merchandising volume of the Milwaukee company had been of the magnitude of

$330,000 a year. The management of the Milwaukee company decided to adopt the recommendations of the survey and arranged with the management of the Union Electric Light & Power Company for the merchandising manager of the latter

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company to assume direct supervision of the reconstruction work in Milwaukee and the establishment of the enlarged merchandising program.

Mr. Michel spent one-third of his time in Milwaukee and
5285 carried on the supervisory functions there in addition to his work with the Union Electric Light & Power Company.

The St. Louis merchandising manager retained supervision of the Milwaukee merchandising operations until nearly the middle of 1924. By that time the merchandising volume of the Milwaukee company for electrical appliances and portable lamps alone had been increased over $800,000.00 a year and the total merchandising volume had been increased over $1,200,000.00. The merchandising profit of the Milwaukee company had been increased from approximately $30,000.00 a year to over $100,000.00 a year. In addition
5286 to this, the improved merchandising facilities and methods of the Milwaukee company greatly stimulated such merchandising by electrical dealers in the Milwaukee area. Thus a period of broad merchandising activity of electrical appliances, lamps and other types of electrical equipment was started in Milwaukee which has constantly expanded and continued throughout the years up to the present time.

This merchandising program has been one of the largest contributing factors in bringing about the average annual consumption of Milwaukee residential customers, an increase from 303 kilowatts in 1918 to 1060 kilowatt hours per cus-

tomer per annum for the year 1939 with corresponding reduc-

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tion in the average residential rate to customers from 6.6 cents to 3.01 cents average in 1939. And I say that that increase is still going on during the current year.

The last figures which I saw for August were of the order of about 1116 kilowatt hours per customer average. I, personally, spent a great deal of time with Mr. Michel and can say from my own experience that we received great value
from his merchandising ability. 5288

Mr. Michel has made a great showing in St. Louis and we were glad that we were a subsidiary so that the inconvenience that went along with losing him at St. Louis could be overlooked and he be made available to us.

Q. In these cases, do the other subsidiaries of The North American Company place themselves at your disposal? A. They place themselves entirely at our disposal as we do with other men that come to us from other subsidiaries because we know that it is desired that there be this exchange of more or less confidential information and experiences.

Such general interchange of intimate information and 5289
special work done on inquiries could exist only within a group bound closely together by common stock ownership. We could not ask such information or help from others nor would we give it to others.

An example of intimate information and information which we have recently received is the case of an inquiry

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I made of Mr. Shea, the president of The North American Company not long ago, when we were buying a new 80,000

kilowatt turbine. I wanted to check from all possible sources what some other current prices were for turbines.

Mr. Shea gave the inquiry to Mr. Moody, assistant to the president, and he personally got in contact with Mr. Neal at Washington and with the Cleveland company—I think that was all. The result was, however, that we secured, very promptly, some intimate information that dealt with what had been paid for turbines of the same general characteristics as those that we were about to buy and considerably for-
5291 tified us in willingness to accept the final price that we got on the turbine. As a matter of fact, the information that we received was helpful in actually gaining a reduction in price.

Q. Could you give us an example of special work which your companies have done on the inquiry or affairs of another North American Company subsidiary? A. At the request of Mr. Edwin Gruhl——

Q. (Interposing) Who was he? A. (Continuing) ——who was president of The North American Company until his death in the early part of the last decade—my recollection is that his request came in 1931—certain studies were made
5292 by our operating research bureau with respect to the Baltimore tie-line and preliminary report was made dated Janu-

ary 2, 1932.

Evidently, Mr. Gruhl wished to get the views of our company with respect to the facts that he was able to transmit to us. Subsequently, North American Company furnished more factual background and there was a further report from Milwaukee dated March 15, 1932.

This last report was at the request of Mr. Doolittle to Mr. Way. I do not claim that Milwaukee laid out the final

program, but I do claim that we were asked early in the game to make a report and I am certain that we wouldn't have been asked if it hadn't been for at least one party to the negotiations, which was an affiliate, and we would have been disinclined to make such a report if there had not been a community of interest.

Q. I don't believe that you have identified the Baltimore tie-line. You meant by that the line connecting Baltimore to what other company? A. Potomac Company.

Q. Of what city? A. Washington. 5294

Q. Have you furnished personnel to other system companies? A. We have furnished much personnel to other system companies. One example is Mr. Harvey Steinhoff, head draftsman of the mechanical division of Wisconsin Electric Power Company. He was transferred to The North American Light & Power Company group and became the

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head mechanical engineer for the design of stations at Jefferson City, Missouri, Des Moines, Iowa, and many other locations.

Mr. Steinhoff was able to carry to those companies the 5295
long training and experience at Milwaukee, with resultant benefit to the associated companies.

Under no circumstances—and I say this rather strongly because we have had to plug the gap left by Mr. Steinhoff over the several years he has been gone—under no circumstances would the company have permitted Mr. Steinhoff to leave for work with non-associated companies, assuming that his services could be retained.

Q. Do you have any element of competition with the other North American subsidiaries? A. We are always competing

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with the other North American subsidiaries in costs and efficiency. We are keenly aware of this competition and it puts us on our mettle.

As a practical matter, we have no such feeling with respect to outside companies, and it is due to the close system relationship. I mentioned a few minutes ago about the St. Louis company paying a return visit to Milwaukee to see how our billing costs were so low and when Mr. LaPorte told me the result of the visit and that he thought the boys were
5297 going to catch up, I said to LaPorte, "Are they actually going to catch up with you?" and he looked at me and winked and said, "Leave it to me."

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Common ownership or financial interest is the vital bond. If we did not have such committee work and general interchange of information with other North American subsidiaries and the family competition with them, important operating results would disappear.

As a practical matter, such work would not be kept up if the holding company relation were severed. This is shown
5298 by the fact that, however friendly we may be with other independent companies, we have no such activities with other independent companies.

Here is the Milwaukee Gas Light Company right in our own home town. We have no such relations with the Milwaukee Gas Light Company. True, it is in another business, but one would assume that there would be lots of problems that would come.

Q. You are in the gas business, as a matter of fact? A. We are in Racine.

We believe we are doing a good job, but that we can always learn from others. There is an inherent danger of stagnation, particularly in a business such as ours, if we stay by ourselves. This constant contact with other North American subsidiaries is what we need to keep us on our toes.

The Examiner: Let us have a little recess.

(Whereupon a short recess was taken.)

By Mr. Browning: 5300

Q. Now, will you summarize for us the relations of your

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company with The North American Company? A. As shown by the testimony here, our staff is mostly local, consisting of individuals whose life background and education have all been local.

For example, you have noted the large number of our employees who have been referred to as having their education at the University of Wisconsin. As a result, our companies have a strong local flavor and we are distinctly part of the local community.

5301 We do all things locally that need doing locally. In the last analysis, our companies are operated by their boards of directors or, as in the case of Wisconsin Electric Power Company, by its executive committee, which again are local in character. They actually make the decisions and operate the businesses.

At the same time, we are now and have long been in constant talks and consultation with the executives of The North American Company. Officers of The North American Company have spent many months in Milwaukee.

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For example, the reference to Messrs. Gruhl and Doolittle. There was a time when Mr. Gruhl was assistant to the president and later, before his death, he spent a great deal of time in Milwaukee working with our conditions.

Our officers have gone to New York for conferences on an average of more than once a month. We, ourselves, have furnished or provided the training ground for various members of the North American staff. For example, Messrs. Gruhl,

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5303 Doolittle and recently Mr. R. E. Moody, assistant to the president. We were extremely sorry to lose Mr. Moody. He was the top operating executive of Wisconsin Gas & Electric Company and Wisconsin Michigan Power Company in the position of executive vice president, but he had this opportunity and we were glad to see him get it.

Thus, North American staff has an intimate background against which they can discuss our problems.

These conferences with North American Company are of great value to us because, in the last analysis, everyone works for someone else and is responsible to someone else. We work

5304 for our stockholders, we want their views, and to share the responsibility of various decisions with them. This would be impossible with widely scattered stockholders with small stockholdings but it is possible with The North American Company. They make very real contributions to our management because of their knowledge of other comparable utility properties, and this, combined with their intimate knowledge of our properties, enables them to give us the benefit of broader experience and knowledge and they have a more detached and objective viewpoint because they are further away from a particular problem and can see more clearly the

relative importance of the various factors entering into the decision.

I have noted that on a number of occasions, when we go

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down there with something, we are all hepped up over some particular phase of it that to them doesn't seem important at all and when, having the thing reviewed in a broader sense by a number of our associates there, we, too, see that perhaps we have gone off on the wrong foot.

Thus, North American Company represents to us real 5306
friends and counselors and a staff to lean on. We know that we can also go to them for help and assistance. The value of the association can not be measured in dollars but is of tremendous value.

To take one example, Edwin Gruhl's insistence in 1932, that we issue $5,000,000 more of bonds than we had contemplated issuing. I remember that situation very well and with my more limited viewpoint from the financial field, I talked with Mr. Way about why borrow more money than it looks as if we actually needed to refinance the outstanding bond issue and some immediate needs, but Gruhl, in his 5307
broader vision—and he was a man of great vision and initiative—saw that there were some times ahead that would make it very convenient to have money in times of depression.

This money actually gave us the funds to go through the depression and, in my opinion, literally meant thousands of dollars, in fact, hundreds of thousands of dollars, to us in savings on account of the lower price at which we could build the Port Washington plant through the depression.

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There are many other instances where the help was just as important, although hard to measure. For example, North American Company sent Mr. Way to Milwaukee from St. Louis. I would hesitate to try to put a dollar value on Mr. Way's services down through the years to the Milwaukee company and, incidentally, The North American Company, but the testimony that I have given obviously makes it a tremendous figure.

Our financial task has been and will be especially difficult
5309 in Milwaukee because of the obsolescence which struck the street railway and interurban property. This makes our financing problems particularly difficult.

In the past, The North American Company, has, itself, loaned us money or advice and carried out financing plans. We need this help in the future. For example, our present construction program, the one that we are starting with the 80,000 kilowatt unit, has been started because of needs in connection with preparedness and we can't tell you at this time exactly how the matter is going to be financed, but we have had the assistance and the encouragement of The North
5310 American Company to go ahead and make the commitments.

We can go ahead and we have done so without actually having the money, as I have stated. Thus, we have a very real need for the holding company financial aid in the future.

There is a great difference between The North American Company and the ordinary stockholder. As a practical matter, we get nothing out of an ordinary stockholder in

the way of advice. The ordinary stockholder, naturally, hasn't either the time, ability or facilities to participate actively in the affairs of our company.

It requires a stockholder like The North American Company with tremendous investment in our companies to be able to do so. I have been to stockholders' meetings in the past when one man would turn out who happened to be a stockholder of the company.

They are, naturally, not interested when things are going well. The association with The North American Company has meant a tremendous amount to us in the past, including great savings, and will mean much to us in the future.

Mr. Browning: That is all. 5312

Mr. Binford: It is about six minutes before four, at the present time. The cross examination will obviously consume more than three-quarters of an hour. I would like to suggest that we recess until 10:00 o'clock tomorrow morning.

The Examiner: Well, I think that is a reasonable request. I hear no objection to it?

Mr. Browning: I have no objection.

The Examiner: We will recess until tomorrow morning at 10:00 o'clock.

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(Whereupon, at 3:50 o'clock p. m., the hearing recessed until 10:00 o'clock a. m., Wednesday, October 2, 1940.) —2,316—

5314 BEFORE THE

Securities and Exchange Commission

Docket No. 59-10

IN THE MATTER

of

5315 THE NORTH AMERICAN COMPANY, *et al.*

Hearing Room 1101,
Securities and Exchange Commission Building,
Washington, D. C.,
Wednesday, October 2, 1940.

5316 Met, pursuant to adjournment, at 10:00 o'clock a. m.

Before: W. W. SWIFT, *Trial Examiner.*

Appearances:

S. PEARCE BROWNING, JR., and CHARLES S. HAMILTON, JR., of Sullivan & Cromwell, 48 Wall Street, New York City, Attorneys for the Respondents.

RALPH C. BINFORD, Attorney on behalf of the Securities and Exchange Commission.

PROCEEDINGS

The Examiner: The hearing will come to order. Before the cross examination of Mr. Van Derzee starts, I will dispose of the motion to strike which I have under advisement. I have reviewed the witness Mr. Van Derzee's qualifications as set forth in this record and, while they are notable in his sphere of operations and extend over a period of many years, I am not convinced that they have been acquired in the field of operations nor that they are of the type which render him 5318
capable to express an opinion as a witness on the matters embraced in the question to which objection was made.

Motion to strike the question and answer appearing at the top of page 2214 of the transcript is granted.

Mr. Browning: May we have an exception?

The Examiner: Yes. I am glad for you to take that. In case I am wrong, the error can be corrected.

Mr. Van Derzee: Off the record, please.

The Examiner: Yes, off the record.

(Discussion off the record.)

The Examiner: You may proceed with cross examination, 5319
Mr. Binford.

Whereupon, Gould W. Van Derzee resumed the stand and testified further as follows:

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Cross Examination by Mr. Binford:

Q. Mr. Van Derzee, in the early part of your testimony on direct examination, you stated at some length your experience in the utility field and your educational qualifications as an engineer.

5320 I presume you have, of course, kept up your contacts with engineering subjects in general along the lines of electric public utilities during all of your active working life? A. Those are things that you absorb by experience in your everyday contacts with your associates in the company.

Q. But you endeavor, I presume, and have endeavored to keep in touch as far as feasible with all general developments in that field that might affect your own particular business, is that true? A. I endeavor to keep up to date on things.
5321 I have contacts with our vice president in charge of power and at our various staff meetings, of course, we talk about developments in the industry.

Q. And you have a highly trained staff part of the duties of which, I assume, are to keep in touch with developments which might be of interest or of value to your own particular business, is that true? A. Yes, they endeavor to keep on top of the field. They usually do it by ideas which they, in the main, originate themselves.

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Q. But you don't mean to say that they do not endeavor
5322 to keep themselves abreast of current developments by other independent companies? A. Oh, by no means. With respect to developments, I don't know they are, particularly, with respect to independent companies. They read the magazines; they go to the inter-company meetings of The North American group; they absorb information from many sources. You are not always conscious where you absorb it from.

Q. Would you say they are always on the alert to absorb, from whatever source it might come, such news of developments and advancements in the industry as might reach them? A. They always have their ears open. A recent de-

velopment in fluorescent lighting, for example, by the manufacturers, is of considerable interest to the utilities. Immediately we had caucuses about the effect of that type of development by the manufacturers on power factor of our system load. The average fluorescent lamp, for example, has a power factor of about 55 per cent inherently.

It was necessary to add capacitors. It was necessary to contact the manufacturers to see that they realized that problem. They are in the business of selling lamps. We are in the business of using them. It was an important development 5324
such as the type I indicated and our ears were open to that, so

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we took the very necessary means of incorporating in our rules which we filed with the Commission that such lamps must have a power factor of at least 90 per cent unless they are in the form of small signs in which event, if they have a less capacity than 250 watts, they may have a power factor of 85 per cent. I think that is a very typical case of keeping our ears open to developments in the industry.

It is pretty hard unless one were wholly deaf not to have heard of that very important development. It almost ranks 5325
with the incandescent lamp.

Q. So you would not blacklist, as it were, an innovation which might have possibilities of economy of operation or other possibilities for benefiting your service, because it might have originated with, let us say, a company of the Electric Bond & Share System rather than of The North American Company System? A. We never blacklist anything. We always have our ears open. The type of development which I have just described was not originated by a

company, but by a manufacturer. Personally, I don't know of any particular underlying developments which have come from what you call independent companies. There may be some.

Q. By "independent companies," I presently mean companies not in The North American Company System. You know of no developments in the industry that have originated with any company outside of The North American System?

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5327 A. In the field of sales I think the Commonwealth and Southern Company developed the objective rate idea, but I wouldn't use it on a bet. Our ten-for-one plan in my opinion is so far ahead of it that there is no comparison.

Q. Can you name another development outside of The North American Company system which pertains to the industry? A. The Hartford Electric Light Company has been for many years experimenting with a mercury boiler directly under the General Electric Company auspices but I don't know anybody that can use it.

Q. Why is that that no one can use it? It hasn't been
5328 perfected? A. I think it is too expensive and hasn't been perfected down through the years.

Q. Can you think of a third example of a development in the industry which originated outside of The North American System? A. My impression is—I am not certain that that development originated with the Hartford Company. The General Electric Company experimented with them on it. From my latest information they are still experimenting.

Possibly future generations may get some benefit from it. It is very hard to say whether such things as the use of very high voltages for transmission such as are used from Boulder

Dam are products of the engineers of large companies or a joint product of utility companies and the manufacturers.

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I very distinctly find it difficult to recall epoch-making inventions of other companies.

Q. You do strive, however, to keep abreast of the possibility of such things happening, don't you? A. I think it is entirely possible that they may happen and quite likely that things come to the attention of some of our engineers that are examined and found wanting for some reason or 5330
another and not brought to me for any executive action.

Q. Then, you are unable to recall at this time any development in the art under consideration which originated outside of The North American Company System, is that true, and which is in use by your company or any of your companies? A. At the moment, they don't come readily to mind. I could, after thinking about the problem, and going through the field of generation, transmission and distribution, utilization, sales, perhaps recall more than I have. I won't say that none have ever come to my attention, but if they have, they have passed out of my immediate consciousness. 5331

Q. You don't recall ever adopting any plan that originated outside of The North American System? By "plan" I mean innovation or change for betterment of service, improvement of the industry. A. I can't tell you just where the use of alternating current in downtown districts developed, or whether our engineers were thinking about it at the

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same time as others. That didn't impress me at the moment you asked the questions as being an outstanding develop-

ment because we had used practically that same system for some little time, fully ten or fifteen years before the adoption in downtown Milwaukee.

The four-wire A. C. distribution system was used by the old Commonwealth Power Company which I recited our company absorbed many years ago. So I wouldn't say that that idea came from the outside. The man that developed it as engineer of the Commonwealth Power Company, was a man that gained his previous experience as an electrical
5333 engineer with our company.

In the field of generation, the important things of powdered fuel, high pressure steam, were practically original products with our company.

Q. Mr. Edison was never connected with your company? Mr. Thomas A. Edison was never connected with your company, was he? By "your company," in this case, I mean The North American Company System. A. Only indirectly through license agreements called "Edison Electric Company licenses" which we took out with the early General Electric Company. Mr. Edison, I think, assigned those patents to
5334 the General Electric Company and we became licensees and years ago got special discounts on account of that relationship.

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Q. What technical journals are received by your companies? A. We take about four copies of the Electrical World, copies of Power and several other magazines which are circulated among people interested. We don't go in for these club offers of nearly all the technical journals because after a good deal of consideration of the subject, we don't believe it is worthwhile.

Repeatedly the McGraw interests are after me to take ten, fifteen, twenty-five or fifty copies of something and give it to groups of engineers because in their opinion that is the only way they can keep abreast of the times.

We have enough copies so that what does happen on the outside comes to their attention.

Q. Do you personally ever visit the properties of operating public utility companies which are not in The North American group for the purpose of observing their methods
or for any other reason? A. I will try to think of the last 5336
time that I visited a company not in The North American group. I think the last time was when I was in Chicago a year or so ago, working on the Committee of Judges who were judging the Forbes' Public Relations Prize for the best paper from any company on public relations.

After that meeting, I visited someone in the Commonwealth Power Company for a few minutes.

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Q. That is the latest occasion that you recall? A. I think he showed us at that time the room which they had just
refitted with new lighting. If I pass through a city for 5337
any reason and see an operating office, I go in and talk to the clerks, see what they are doing in a merchandise way, but I can't tell you where I had such contact last. I think it was when I drove by the windows of the Madison Gas & Electric Company. I stopped in there and talked to Mr. St. John, president, ~~on an undertaking~~ that we had jointly with the University of Wisconsin, to establish a new practice cottage for home economics students. I think that is about the last contact I had with another public utility.

Q. When was that? A. That was the early part of August this year. I went out there specifically to talk to him about the practice cottage.

Q. You didn't, at that time, other than as a purely corollary matter, discuss with him the operating experiences in his plant and in his transmission and in his distribution systems? A. I asked him how he was getting along with his proposed interconnection with Wisconsin Power & Light Company and he said fairly well.

5339 Q. You knew of the proposed interconnection? A. Yes, I did.

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Q. You keep in touch to that extent with the activities of other companies? A. Well, the reason that I came in contact with that was that we have, as stated by Mr. Schmidtman, an interconnection agreement with Wisconsin Power & Light Company, and Mr. Neff had told me that in any new agreement he made with Madison Gas & Electric Company, he expected to renew that interconnection arrangement.

Q. You stated Mr. Schmidtman's position with your
5340 group of companies. Would you mind stating it again please? A. He is with the operating research bureau, working on technical problems in a special investigating division.

Q. How long has he occupied that position? A. I can't tell you just when he became head of it but it has been for a number of years. He is under assistant operating research engineer who has other divisions under him, as I testified, and the operating research engineers who are assistants report to Mr. Seybold who is research engineer as well as vice president.

Q. Of course, upon direct examination for the purpose of the record, as was reasonable, you used notes which served to refresh your recollection on numerous matters, did you not? A. I did.

(Discussion off the record.)

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By Mr. Binford:

Q. Since you have been in Washington during the course 5342
of this hearing, I presume you have visited the plants or offices of Potomac Electric Power Company, one of The North American Company subsidiaries, is that true? A. Well, the facts are that I came down here with Mrs. Van Derzee and I had taken my vacation without her earlier in the year in California. I think that answers why I haven't been able to go through plants of the Potomac Electric Power Company, much as I would have liked to, but to make up for that part, on account of the natural review of various things, which is proper so as not to unnecessarily lengthen the investigation, we asked Mr. Neal to visit us last night to 5343
try to make up for our visit and he came to our rooms.

Q. Have you ever visited the plants or any of the plants of the Potomac Electric Power Company? A. No, I haven't. Until my recent visits here, I have not been in Washington but once before.

Q. You testified yesterday, I believe, that on one occasion you made a trip to Cleveland in connection with certain matters more particularly described in your testimony at that time. At that time, did you visit the plants or any of the plants of the Cleveland Electric Illuminating Company?

A. My recollection of my testimony is that I did not testify that I had been to Cleveland, but I did testify that I went

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to St. Louis to visit what was then known as the Union Electric Light & Power Company.

Q. Sorry. A. At that time I went through plants of the company.

Q. And that was in the year 1926 or '27? A. 1927.

Q. You haven't visited those plants or that company since
5345 that time? A. That is right.

Q. Have you ever visited the plants or any of the plants of the Cleveland Electric Illuminating Company? A. Never have.

Q. Have you ever been to Cleveland other than to pass through? A. I have never been to Cleveland to my recollection except to pass through.

Q. Have you ever visited any of the plants of any of the companies of The North American Company System other than those of the three companies with which you are at present connected? A. None except the plants of the Union
5346 Electric Light & Power Company.

Q. And that only upon the one occasion which you have previously mentioned? A. That is correct. We do not, in the first place, have as much time as we would like from the

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operating affairs of our own company to go visiting. We have engineers and vice presidents who make it more of a point to see the properties. We have a field in Wisconsin, which is rather large, and takes considerable time to keep acquainted with it, but the mere fact that I don't go person-

ally to various plants, doesn't mean that I am wholly ignorant of the practices as reflected back to me as a result of the inter-company meetings and correspondence that I have from time to time with the companies.

Q. Is your knowledge sufficient to compare the personnel and divisional and district set-up of your group of companies with that of the Cleveland Electric Illuminating Company? A. I wouldn't care to testify the way I have with respect to the organization of my own company as to the detailed organization of the other companies. 5348

I can tell you what was said to me, for example, very recently by Mr. Dornbrook, chief engineer of power plants in the regular correspondence, reporting to Mr. Post and me, things that have happened elsewhere, that did relate to the plant operations of the Cleveland Electric Illuminating Company.

Q. My question was directed to the divisional personnel set-up. A. May I continue?

Q. Yes, sir. A. And he said that the men in the plant

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organization of the Cleveland Electric Illuminating Company were able, because of the historical background of employment and things that they do, to do a great many more operations individually than our men were, who were highly specialized and also had certain restrictions as to their going from one kind of work to another on account of the unionization. 5349

We were discussing the advantages of the Cleveland Electric Illuminating set-up from a labor standpoint—a highly confidential thing that I wouldn't care to have expressed

elsewhere, but typical of the kind of things that we do get through the route of these inter-company committees.

I, of course, know that different companies have presidents, vice presidents, and the usual officers, but as to the exact duties of each of them, I have had no particular need to know their precise scope, because with respect to that, we have found a method, we think, that operates well with us. We are always willing to learn and do take advantage of information that comes, such as this piece that I recently
5351 mentioned through Mr. Dornbrook we are going back to our unions to see if there is some way, when a man changes work from one classification to another, that he can do it in a more convenient way than having charged so many cents per hour for five hours on this job and a different rate with the remaining hours on another job.

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Q. Despite the fact that you have never personally been to Cleveland, as I understand it, you know, of your own general knowledge, that the area served by Cleveland Electric Illuminating Company is far different, in the character of
5352 its customers, than the area served by your group of companies, in that Cleveland is a highly industrial area, whereas the areas, speaking generally, served by your three companies, represent to a large extent residential and rural customers? A. Well, I don't know, as a fact, the inference that you make that our territory, as a whole, is largely residential and rural.

I do know that what we call the service area for the group of three companies, is probably a larger area than served by Cleveland Electric Illuminating Company, but that, with re-

spect to the territory of Wisconsin Electric Power Company, we have a very highly industrialized area—the greater Milwaukee district, which has many of the characteristics of the area served by Cleveland Electric Illuminating Company.

We have a large steel industry; we have breweries. In spite of the fact that Milwaukee has such a reputation in that respect, the manufactur of beer has never been first in the total output; it has always been exceeded by steel.

We also have a very substantial textile industry, food processing, and altogether, at the peak of industrial activity 5354

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in the greater Milwaukee area, the output of products was estimated, by the Association of Commerce, at nearly a billion dollars.

Now, you can't get a billion dollars worth of products output in a substantially residential and rural area. It is true that we have had a very remarkable development of rural customers, but that has come about because we have taken the bull by the horns and run lines up and down practically every highway of Wisconsin Gas & Electric Company, and 5355
quite extensively, but not to the same extent, in the rural areas of Wisconsin Michigan Power Company.

Incidentally, we probably have more rural customers than the others, on that account.

Perhaps they are not as fully developed, from the standpoint of lines, as we are, and if they were they would have more rural customers by comparison.

I would say generally, though, in answer to your question, that we have a problem that is quite similar to Cleveland in the greater Milwaukee area.

We are not as large as Cleveland, but we are affected because of the ups and downs of industrial power in somewhat the same way.

How do I know that? Because I have weekly before me, sent by The North American Company, the relationships of output that I have testified to.

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Q. Are you familiar with the distribution and the transmission systems of the Potomac Electric Power Company?
5357 A. I have never had occasion personally to study those systems.

I have no doubt that the member on our electrical committee of the inter-companies, and Mr. Post, vice president in charge of power, are probably quite familiar with the details of it.

I have no particular occasion to be concerned with the precise size of pole tags, for example, although, in taking a walk behind the hotel yesterday, I did examine specifically a pole tag of Potomac Electric Power Company. It is much larger than ours. The figures are raised considerably more.
5358 I looked up at the pole and observed the type of construction, how they guy it, and there was nothing particular in that observation that impressed me one way or the other.

They have a type of distribution system that is probably more or less common knowledge to anyone who wants to observe it.

Q. But you have never had occasion to observe it? A. I wasn't informed that it was particularly unique. I think they have more underground than we have. I have observed the slot in between the rails of the transportation system, and that is an underground method of distribution of railway

energy that we don't have to have in Milwaukee—wouldn't
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have it if we could.

Q. You weren't present during any of the testimony in this case which related specifically to the Potomac Electric Power Company and its subsidiaries, and its and their operations, were you? A. No, I was not.

Mr. Browning: Will you please read that last question? 5360

(Whereupon the last question, as above recorded, was read by the reporter.)

The Witness: No, I wasn't, but if I had occasion to find out something, I know, from my acquaintanceship with Mr. Neal, that all I would have to do would be to come down here and Mr. Neal would just go to great lengths to show me anything I wanted to know, and give me every detail that I needed.

The fact that I don't need those details is not an evidence of lack of interest. 5361

By Mr. Binford:

Q. Have you read that testimony, to which I referred? A. No, I have not.

Q. You were likewise not present when the testimony was given in this case, specifically relating to Cleveland Electric Illuminating Company and its operations, were you? A. No, I was not.

Q. Have you read that testimony? A. No, I haven't.
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Q. Your experience in the actual field of electric public utility operation has been confined exclusively, has it not, to the territory now served by the three companies with which you are at present connected? A. That is correct. Direct operating experience. There was one position I failed to indicate, in giving the details of my qualifications:

I worked on an underground gang, putting in an underground conduit, in Milwaukee, for a number of months, if that is of any value in indicating I know what a conduit
5363 looks like and what it feels like to be in a ditch.

Q. Have you ever had any contact with any state regulatory bodies, by which I mean bodies exercising regulatory power over electric public utilities, in any states other than Wisconsin and Michigan? A. No, I have had no direct contact with bodies regulating public utilities in any other states than Wisconsin and Michigan.

Q. You make no claim to personal knowledge, as to factors which influence the decisions of such bodies, other than in those two states? A. I lay claim to knowledge of a good many underlying principles, which those bodies must have in
5364 mind in making decisions. That is, factors relating to the basic principles of rate-making, depreciation, property ac-

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counting, the basis on which securities are issued, but I have never sat in their councils nor do I know the exact mental processes that they have gone through.

With respect to the latter two comments, I can't say that even with respect to the Wisconsin Commission or the Michigan Commission.

Q. I believe you testified, in substance, that at one time the operating research bureau of Wisconsin Electric Power

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Company made a study of and preliminary report concerning the interconnection of Potomac Electric Power Company with Consolidated Gas & Electric Company of Baltimore, is that correct? A. I made a statement which, I would like to add, contains my complete knowledge of the fact that reports were asked for by representatives of The North American Company, based on preliminary information that they sent, and then some subsequently expanded information, which was worked up into reports that The North American Company used in some way, concerning a tie line which I 5366
had never seen and know nothing about.

Q. Do you know who had charge of that investigation? A. No, I don't. That was eight or ten years ago. My feeling is that the normal arrangement for a report of that nature would be that Mr. Seybold would handle it himself.

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Q. Mr. Schmidtman would have nothing to do with it? A. I can't say as to whether Mr. Schmidtman was in the field, of that particular division he heads now, at that time or not. I really don't know.

Q. What would be Mr. Schmidtman's rank in that divi- 5367
sion, if I may speak of rank in that connection? Would you consider him, possibly, the second or third highest man in the bureau? A. The organization is like this: Mr. Seybold still retains the position of research engineer. He has three assistant research engineers. Under one of them is the work of Mr. Schmidtman.

(Discussion off the record.)

Q. Will you please glance at Respondents' Exhibit No. 41, which is the organization chart of Wisconsin Electric Power Company?

5368 *Gould W. Van Derzee—By Respondents—Cross*

I call your attention to Page numbered 3 of that chart, in which, in the operating research bureau, there is shown a "special investigation division", of which Mr. E. H. Schmidtman is supervisor.

How long has that special investigation division been in existence? A. For some time, but I do not recollect how long.

Q. Would you say whether it has existed for ten years or more? A. I would say that it has not existed for ten years.

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5369 This particular arrangement has developed in connection with the appointment of additional research engineers from time to time, and one of those was appointed within the last two or three years, and at that time I think there was a rearrangement of the specific duties.

Q. Should an investigation be made at the present time, of the type involved in your earlier consideration, of the connection between Potomac Electric Power Company and The Consolidated Gas & Electric Company of Baltimore, would such an investigation fall within the province of this special investigation division shown upon the chart, which is Re-

5370 spondents' Exhibit No. 41? A. I am inclined to think that it might, because Mr. Schmidtman, during the past three or four years, has gained a good deal of experience in connection with his statewide study of interconnections that he made.

Actually, the way in which a highly technical problem of that kind would be handled is about like this:

The research bureau would probably be assigned to the preparation and consolidation of material prepared both by the research bureau and also by the electrical engineer of the Company. In such a thing, I believe that he would also be consulted.

Q. At the time that the actual report and investigation was made upon this subject, was the position of Mr. Schmidtman in the operating research bureau such that he would

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normally have at least known of the making of such investigation and the making of such report? A. He might have known it was in the shop. I really can't tell you whether he knew anything other than that.

Q. As a matter of course he would know that, though, would he not? A. I think he would be likely to know that 5372
there was an investigation in the shop. I didn't receive the original inquiry in this matter from the officers of The North American Company, and I have a very hazy recollection of what the flow of instructions was.

I really had no occasion to know about it or remember it but it is a fine example of the Company having put itself out, with no immediate return, just because it was, in effect, helping out a sister company.

Q. You say "the Company having put itself out". Do you consider that there was an outlay of money involved in anything of that kind? A. I don't know that there was any 5373
out of pocket expense, but I know that somebody had to spend time, and it is very likely that if the X. Y. Z. Company had asked us to do it, we would have said, "Sorry; we are too busy."

Q. You had to spend the salaries and the overhead, though, isn't that true? A. I don't think they donated their

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services.

Q. At least it isn't usual, is it?

(No answer.)

Q. As an engineer, are you familiar with developments in recent years of interconnections for the exchange of power between diversely owned electric utilities throughout the country? A. I know that there are interconnections, but I haven't charged my mind with learning about them. I am familiar with some in Wisconsin that have direct effect on our companies.

I know, for example, that Wisconsin Power & Light Company, with which we have an interchange contract, at one
5375 time, I believe, had an arrangement with some interests in Illinois, by which emergency power could flow, but I don't know the details of any outside inter-company contract.

Q. While you may not know the details of the contract, you do know that such interchange arrangements exist and are in operation, and have been so for some years, do you not? A. Well broadly speaking, I know that there are interconnections, but if you say do I know that there is an interconnection between Point X and Y? I can't say that there is such an interconnection without looking it up.

Q. You don't know the general manner in which such in-
5376 terconnections and interchange of power takes place? A.

Well, I know from our own experience the manner in which the interchange of power takes place between our own companies and between other companies in our state; whether those arrangements are the same, whether the contract is motivated by the same basic reasons, I can't tell you.

I can't tell you a single detail, much as I would like to respond to your question about the exact locations of other interconnections or the basic reasons therefor, outside of the fact that it is presumed to effect economies and advantages.

Q. You don't know of any company outside of your own group, whose source of power is mainly from water power, which has an interconnection with a company or companies whose sources of power are primarily from steam? A. I don't know whether you could class Wisconsin Power & Light Company in that category or not. They have a substantial amount of water power.

They also have a substantial amount of steam. They have an interconnection with us, meaning Wisconsin Electric Power Company. 5378

But, outside of the state, I can't give you precise information on that.

I know that Pacific Gas & Electric Company has a very substantial amount of water power, and I believe that their steam plants are relatively unimportant.

With whom they are connected I can't say. I have no par-

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ticular reason for knowing that precise type of information.

Q. Have you testified as to what proportion of the electric business done in the state of Wisconsin is done by the three electric utility operating companies in your group? A. 5379
No, I have not.

Q. Could you state approximately what is? A. Generally speaking we have a phrase that may give you an idea on that, which is not exact, and that is that the North American group do approximately one half of the electric and gas business in the state of Wisconsin.

—2,343—

Q. Is that then far more than is done by any other affiliated group in Wisconsin? A. Yes. The next largest com-

pany is Wisconsin Power and Light Company and then comes Wisconsin Public Service Company and Northern States Power Company. I don't recollect precisely their relationships but there is no other company or group of companies that does as large a business as is done by our group in the service area.

Q. Then, in magnitude, at least, there is no situation in Wisconsin from which you could draw any practical conclusions of benefit as to the situations in your own three
5381 companies, is that true?

Mr. Browning: May we have that question read back?

(Pending question was read back.)

The Witness: I don't think I understand the question. Can you explain what it intended to say?

Mr. Binford: Perhaps you had better read it again.

(Pending question read again.)

Mr. Browning: I suggest that the question should
5382 be rephrased.

The Examiner: Try it over again. Can't you rephrase it? I don't quite understand it.

By Mr. Binford:

Q. Let me state the question another way. From what you have said, it is apparent, is it not, that the other public

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utility operations in Wisconsin, taken individually, are so much smaller than those of The North American group that you can't benefit much from their experiences in your own

situation, is that true? A. Don't you mean that we can't benefit much from interchange with them because they don't have capacity of sufficient magnitude to help us out much on an interchange?

Q. No, that isn't what I meant. I won't press that question any further. If Wisconsin Michigan Power Company should be divorced in ownership from the interests that own the Wisconsin Electric Power Company, you are unable to state, I take it, from your experiences in that field, and
from any source other than your own knowledge of the situa- 5384
tion, that a satisfactory interchange of power agreement might not be worked out between those two companies? A. If Wisconsin Michigan Power Company were divorced, as you say, from any family relationship with Wisconsin Electric Power Company, and were thereby forced to dispose of its surplus hydro-electric energy to a buyer who would look at the proposal entirely from the standpoint of immediate benefits, I am certain that the arrangement for thus disposing of the hydro-electric power surplus would be considerably less satisfactory to Wisconsin Michigan Power Company operating alone—— 5385

Q. But it follows—pardon me. A. —than it is now.

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You are probably not familiar with the fact that there is no other market for the large amounts of surplus hydro-electric energy that comes down from the north when the rivers run high than the power pool, so to speak, that is created by the existence of these large industries on the system of Wisconsin Electric Power Company, and that the result would be that a very substantial amount of the natural resources would go to waste.

5386

Now, I don't mean to indicate to you that we could not have a contract with an outsider or that smaller amounts of energy might not be taken when, as and if we found it really convenient to take it. That is really what dump hydro-electric energy is but I do say very definitely and it isn't necessary for me to know at all what the XYZ Company does in Indiana, that the arrangement would not be as good, even though we could make an arrangement.

Q. You base that upon your own knowledge of that par-
5387 ticular territory and the particular relations existing between the companies? A. I base it on my own knowledge of the specific problem which is the one we are discussing. The fact is that our steam power plant engineers come to me at quite frequent intervals and tell me of the situation which is created by dumping a lot of hydro-electric energy on the company when they don't want to take it, but they take it to avoid an economic loss to the family without im-

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mediate loss, perhaps, but with some, to them, which is more than made up for at other times.

5388 Q. The security holders of Wisconsin Michigan Power Company are not identical with the security holders of Wisconsin Electric Power Company, are they? A. No, they are not.

Q. Then what did you mean when, in answer to the last question, you spoke of the family relationship? A. I spoke of the family relationship in that the common stock of Wisconsin Michigan Power Company is wholly owned by The North American Company and most of the common stock of Wisconsin Electric Power Company is owned by The North American Company.

The fact that there are some other common stockholders at the present time makes it difficult to state that they are in all respects identical and that is the reason that I did not say that the common stockholders were identical.

Q. Then is it your thought that in dealings between two companies, despite the fact that the assets of these two companies represent the investments of distinctly different groups of people, it is perfectly proper management to think only of the interest of the whole, that is to say of the two jointly without distinction, if some person has enough com- 5390
mon stock to achieve control of each of the two companies, whatever may be the detriment to the one company on an occasion or the detriment to the other upon another occas-

ion? A. We don't consider that there is any detriment to any stockholder in this operation.

Q. But yet you consider—— A. We do not consider the interests of one particular stockholder as compared with another. We do consider, within each company, the interests of the corporation and when I work for my company I
am considering the most effective and efficient means over the 5391
long pull to bring about the best service to the customers at most reasonable rates and I know that if we do that and work diligently that benefits will flow to stockholders of the one company and also to the other.

I happen to be an officer of each company, although I am not the head operating officer of Wisconsin Michigan Power Company. Now, in the case that we are talking about the thing that I said in connection with your question had this general intent, that if Wisconsin Michigan Power Company were wholly separate from Wisconsin Electric Power Com-

pany and that company came to us like Wisconsin Power and Light Company has, and said, "We would like to make an interchange agreement", we might make an interchange agreement quite similar to that for dump power which we have now, although I think we might make some changes.

Q. In other words—— A. I am not through. The rate is $1\frac{1}{2}$ mills per kilowatt hour. The point is, however, that

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even though we might have identical arrangements in the
5393 two contracts, one where there is a family interest and the other where there is no family interest—I am not saying we would have them identical but just assuming they are—then the method of operation under those contracts is subject to very wide interpretation and latitude on the part of the Wisconsin Electric Power Company.

In the present case hydro-electric energy comes down at a time when it may not be most convenient to take it, yet it does represent an economic loss if it is not taken and if we take it our normal margin that we may have figured that we got by taking it and not burning coal is reduced
5394 and might be eliminated entirely for a short time.

Now, in the case that exists now, where there is a community of interest, we take that power and the fact that we take it does not throw any burden on the stockholders of Wisconsin Electric Power Company because the momentary loss on a few kilowatt hours, if there is any, is infinitesimal.

Take the case of Wisconsin Michigan Power Company, an independent company, calling us up when we have got only 20,000 kw. night load and saying, "We are going to dump 15,000 kw. on you if you can take it." What I mean to say is that at such times we would not be likely to inconvenience

ourselves if there is inconvenience or reduce the margin of profit in the exchange, or suffer an extremely small momentary loss to be made up later by taking large quantities

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when we can use it. It gets down to there being a family relationship that does not exist when two companies are separate and as to stockholders experiencing any particular effect from variations in the amount of value from time to time I don't think you can find it as far as Wisconsin Electric Power Company is concerned to any great extent. 5396

Q. Yet you don't think that such a result could be achieved by what is quite often spoken of as arm's length bargaining between independent parties? A. I have testified that we could go so far, and we have with Wisconsin Power and Light Company, as to make a form of agreement and such an agreement could be achieved, but I say that we would not go as far otherwise as we might in the case of companies which are divorced as we are willing to when it is in the family.

Q. As a matter of fact, don't certain other potential customers exist for the excess power of Wisconsin Michigan, 5397
such for instance, as certain subsidiaries of the Standard Gas and Electric System? A. Not for dump power, according to my understanding of the situation; they have plenty of their own.

Q. Possibly not for dump power alone but if dump power were not required to be taken alone, but power other than dump power, firm power, were at times furnished, couldn't such an arrangement be perfected, possibly? A. Well, I

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can't speak for the managements of other companies. Wisconsin Public Service that you speak of evidently finds need for additional power because I read just recently that they are putting in a new steam plant addition at Green Bay. I think it must be obvious that if they could readily get that power from some other place and the character of power that is sent down to us for dump could be disposed of to them for firm power by some magic, that Wisconsin Michigan would immediately take them up on it and they would
5399 use it.

The facts are that it isn't usable in the form it comes down to us.

Q. There is no insurmountable geographical difficulty in the interconnection of Wisconsin properties with the properties of other utilities than the Wisconsin Electric Power Company, is there? A. I know of no insurmountable difficulties with respect to physical connection of the lines of one company with the other by the expenditure of certain amounts of money.

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5400 Q. Wouldn't you go even further and say that such an interconnection would be perfectly feasible if desirable? A. The determination of a matter of that kind calls for my knowledge of the things that are going on in the mind of Wisconsin Public Service Company, and I can't predict that any more than I could what was in the minds of the Commissioners.

Q. I would restrict the question to feasible from a cost standpoint and technical standpoint. A. I have made no study of the problem. I wouldn't want to express an opinion without making a study.

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Q. You wouldn't want to express an absolute opinion that it was not technically and economically feasible, would you? A. I would not care to make a statement that it would be impossible to build a line from point A on the system of Wisconsin Michigan Power Company to point B on the system of the Wisconsin Public Service Company, but as to whether it would be of any value when the line was built, I am unable to say.

The Examiner: Let us have a little recess. 5402

(Whereupon a short recess was taken.)

By Mr. Binford:

Q. Mr. Van Derzee, you described at some length yesterday on direct examination, a recent meeting of one of The North American System inter-company committees, the accounting committee I believe it was. Did you, personally, attend that committee meeting? A. As I testified, I ap-

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peared at that meeting. I was there for quite awhile. I could not stay all the time because I had a call from the 5403
office and I was back and forth, but I did this: We had three representatives there and in addition to the parts that I saw directly and the talks that I had with the men directly, I got reports on everything that went on. I am thoroughly familiar with what did go on. I attended the meeting.

Q. Your testimony yesterday was based upon notes made by you from your attendance at the meeting and from reports given to you by others from their attendance, is that true? A. That is true. I failed to state, in giving the names

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of those who were there, that Mr. P. D. Preger, controller of The North American Company, was present, and Mr. Thurston, the auditor of the company was also there, and that the meeting was really under the direction of Mr. Preger.

The origination of this accounting committee idea was with Mr. Shea of The North American Company, and when I attended the meeting of operating executives of the subsidiaries several months ago in New York—I don't remember the exact date—it may have been the latter part of May or it may
5405 have been in June—he stated that such good results had come from the other two committees that he wanted to start immediately an accounting committee for the interchange of information and practices among the subsidiaries which

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would work with the same facility and freedom of expression of thoughts and confidential information as the other committees worked.

Q. Which were the others—pardon me. A. The first meeting of the committee was then held at New York and then followed the meeting of the subcommittee which handles
5406 budget matters, which I attended at Milwaukee, as indicated in my testimony, and then followed the meeting of September 16.

Mr. Preger was there and had a good deal to do with the direction of the meeting and I am sorry I omitted to say that he and Mr. Thurston were there.

Mr. Browning: Who is Mr. Thurston?

The Witness: Mr. Thurston, I testified, was the auditor of The North American Company, and it was Mr. Thurston who was so much interested in the sub-

ject of audits which was one of the chapters for discussion.

Mr. Thurston, I think, had the original idea of creating these flow diagrams which show the passage of any accounting transaction from the originating department down to the books.

By Mr. Binford:

Q. From your observations, at the meetings of this committee, I understand it to be your opinion that the activities 5408
of the committee promise considerable benefit to the several subsidiary companies in The North American system. Is

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that correct? A. It is my opinion that such benefits will result.

Q. What were the other committees which you mentioned as to inter-company committees within The North American Company system? A. I testified to the existence of the station advisory operating committee and the electrical committee.

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Q. Have you ever attended a meeting of either one of those committees? A. No, I never have, but I have received reports from our vice president in charge of power and on various matters that have come up through those committees.

Some of my testimony——

Q. (Interposing) What was the last meeting of either one of those committees, or do you know? A. I can't tell you the exact date. Usually, Mr. Post and Mr. Dornbrook discuss important features that come up in the meetings with me; obtaining those discussions and listening to their opin-

ions as to the relative merits of things that are discussed such as I indicated in the testimony, is more or less a regular part of our business and I don't attempt to record in my mind the date I had the last discussion, but frequently Mr. Post says, "I would like to have Mr. Dornbrook go to this inter-company meeting. I don't want him to miss it. Have you anything that would interfere with his going?" Usually, I

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say, "no that is about as important a thing as he has to at-
5411 tend."

Q. Usually, about how much time does that take? A. Well, usually, Mr. Dornbrook not only goes to the meetings but if the meeting happens to be in Cleveland or Potomac, he spends a little time looking around the property. As a rule he is gone two or three days or some such figure, or even longer, depending upon how much outside work there is in those companies.

Q. Did you state how long this September 16 meeting of the accounting committee lasted? A. From the beginning of the arrival of the individuals to the departure of the last
5412 one, I think it was about two and a half days.

Q. That was the first or the second formal meeting since the organization of the committee? A. That was the second formal meeting of the committee as a whole, but its subcommittee on budgets had met and that was rather a large meeting.

Q. When did that occur, as nearly as you can place it? A. I testified to that having occurred a couple of months ago and it met in Milwaukee and I attended it. I told you the reason why I attended it.

Q. Yes. And the organization meeting; that is to say, the first meeting of the committee, after, I understand, the

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suggestion of Mr. Shea occurred—that was about when? A. I would say it was within a month or six weeks after the meeting of the executives of the subsidiary companies in New York.

Q. What was that date, then? A. I stated to you I didn't recollect exactly, but I think it was in the latter part of May or June. I can look it up for you if it is important. 5414

Q. So this committee has been created and these inter-company activities have been begun since the instigation of the present proceedings? A. I don't know what you mean by "the present proceedings."

Q. This case in which you are now testifying. A. Well, I couldn't say as to that. I didn't know when you began.

Mr. Browning: I suggest that the record will show that.

Mr. Binford: I acquiesce.

By Mr. Binford: 5415

Q. So far as you know, since the creation of the present committee, the same problems which it was designed to aid have existed, have they not? A. Some of the problems that I mentioned that were discussed at the meeting were current problems. For example, the question of how does the selective service act affect accounting matters. I think that also a gradual consciousness of the need for further perfection

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in auditing work as well as in all other work has been there.

5416 *Gould W. Van Derzee—By Respondents—Cross*

We had auditing work sometime ago. Price, Waterhouse & Company has indicated to us ways and means from time to time in which it could be effected. We have tried to follow those suggestions. We have made real progress in that type of work, but now comes a new face into the picture in the form of Mr. Thurston who has had a great deal of experience. He suggests that we ought to make these flow diagrams. Perhaps we have been making them unconsciously in doing auditing work because of our very intimate knowl-
5417 edge of how a transaction does flow from the source to the books, but he doesn't know that, so he wants to see.

Hence, we engage in an activity that puts on paper the thing that may be wholly in the minds of the controllers. That is one of the activities. We have, naturally, had interchange from time to time, but not on the present scale. Because of the family relationship of information between controllers, one is willing to tell the other his secrets.

The basic relationship has been the same for a number of years. The fact that no formal meeting of all the people primarily interested in these things has been called, doesn't
5418 mean that no progress has been made in that direction, or that we aren't subject to improvement by new methods.

Q. Other than for the purpose of testifying in the present

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proceeding, namely, that in which you are now testifying, when was the last occasion of a visit of a representative of your company, any one of your companies, to the properties or offices of Potomac Electric Power Company? A. I can't tell you that. I don't know.

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Q. Do you recall any occasion when any such visit was made? A. By whom in particular? Are you referring to any particular individual?

Q. No, no particular individual; any individual connected with your company. A. I don't have in mind the exact meeting place of all the meetings of the electrical committee and the operating committee, but in connection with those, I am reasonably certain that there have been visits to all the properties.

Q. But you don't know, as a matter of fact, of any occasion upon which any officer or employee of your company has 5420
visited the Potomac Electric Power Company properties or offices, do you? A. I am unable to state to you the exact dates at which the visits which have occurred in the past have occurred.

Q. Are you able to state that there ever were any such visits? A. Outside of the plan of rotating the place for the electrical and station advisory meetings, which, in the course

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of time, would normally take in all the properties and would 5421
result in meetings of our people with the employees of other companies, I can't tell you the date on which any other officer appeared at any particular company.

Q. The last question wasn't directed to the date; it was as to whether you can testify that there ever was any such visit at any time? A. I can only tell you my background of thought in the matter, that at sometime or other officers of our company have visited. It would be difficult for me to prove to you that I ate lunch three years ago last February, but I am reasonably certain that I did.

Q. And you are likewise reasonably certain that some officer or employee of some of your companies has been in Washington at some time? A. Yes.

Mr. Hamilton: Is there any doubt on that score?

By Mr. Binford:

Q. In respect to the offices and properties of the Cleveland Electric Illuminating Company, what was the last occasion upon which any representative of your company vis-
5423 ited such properties or offices? A. Well, I make substantially the same answer with respect to those who are on the operating committees and my answer with respect to the indefiniteness of my mind as to dates when any of our officers

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went to Cleveland is the same as with respect to Potomac Electric Power.

Q. But, other than the occasion to which you testified yesterday, can you remember any occasion, regardless of date, on which any representative of any one of your com-
5424 panies visited the operating properties of the Cleveland Electric Illuminating Company? A. Outside of the visit of Mr. Schmidtman, I have in mind no dates or occasions of visits of our officers to the Cleveland Electric Illuminating Company, but I don't wish to convey by that that they haven't visited the company.

Responsible officers of our company are able to travel here and there without getting permission from me. It is particularly true of the president.

Q. Do you recall any occasion other than any to which you have previously testified in this proceeding, of a visit of

any representative of any one of your three companies to the properties or offices of the Union Electric Company of Missouri, or any of its subsidiaries? A. With respect to the matter of recollection, my answer is the same as last given with respect to Cleveland, but if you view the matter as important, I certainly can have history reviewed and see if I can find out.

Q. But, of your present recollection, you are unable to state as to whether any such visits have taken place, or if so,

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when? A. I believe that visits of that kind have taken place and for definite reasons, but I can't tell you the time nor do I know the reasons. There are so many things go on in this business that you don't attempt to recollect things of that type over the decades.

For me to say that an officer of our company never visited any of these companies, would be ridiculous, because I am certain that it isn't so and I know that the representatives of the inter-company committees which are on the firing line in their particular problems meet a number of times a year.

Q. How many times a year? A. Wherever the meetings are held. 5427

Q. How many times a year? A. And as to whether or not they attend all the meetings or are able to attend all of them, I can't say, but I believe that they would average four a year in attendance and——

Q. (Interposing) Mr. Van Derzee, will you please refer to Respondents' Exhibit 32, which is a blueprint map of the territory served by the three companies with which you are connected? A. Yes.

Q. You will note that there is an un-crosshatched strip of territory intervening between the northernmost territory an shown as served by Wisconsin Gas & Electric Company, and the southern area centering around Appleton served by —2,362— Wisconsin Michigan Power Company.

Can you state what the source of electric utility service is in that area extending across Manitowoc, Calumet, Winnebago, and Waushara counties, and also south of Winne-
5429 bago County, in Fond du Lac County? A. It has been quite a long time since I have examined the agreements which exist in most cases and are filed with the Public Service Commission as to the operating territorities for distribution.

My recollection is that the area which you refer to, east of Lake Winnebago, is generally served by Wisconsin Public Service Company, and that the area to the west embraces territory in which Wisconsin Power & Light Company has distribution lines. I haven't a map of their systems before me so I can only testify from recollection.

Q. Would it be correct to say, to the best of your recol-
5430 lection, that all of the territory south of the south line of the northern area, the northern service area, shown as served by Wisconsin Michigan Power Company, and east of the southern area so served, down to the northernmost service area of Wisconsin Gas & Electric Company, is served by Wisconsin Public Service Corporation, or affiliated companies?

Mr. Hamilton: Could that question be read back again?

(Whereupon the pending question was read by the reporter.)

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Mr. Binford: Referring, of course, to the area shown on the map, Exhibit No. 32.

(Discussion off the record.)

By Mr. Binford:

Q. May I further identify the territory indicated by my question as lying within the counties of Marinette, Menominee, Oconto, Brown, Kewaunee, Manitowoc, Calumet and Winnebago? A. That area is generally served by Wisconsin 5432
Public Service Company except insofar as there are municipal distribution systems located therein. It is largely a rural area with a few cities.

Q. Now, the remainder of the territory immediately surrounding the southern distinct area shown as served by Wisconsin Michigan Power Company, is similarly served by Wisconsin Power & Light Company, is it not? A. Wisconsin Power & Light Company generally serves along the boundary lines which abut Wisconsin Gas & Electric Company and Wisconsin Michigan Power Company southern division on the west, and in an area in Sheboygan and a part of Fond 5433
du Lac County.

Q. In other words, the area served by Wisconsin Michigan Power Company centering upon Appleton, as shown upon the map to which we are referring, might be described as somewhat of an island service area completely surrounded by service areas of Wisconsin Public Service Corporation, might it not? A. I wouldn't describe it as an island sur-

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rounded by Wisconsin Public Service Company. In fact, I wouldn't describe it as an island at all. It is a matter of

5434 fact that every company has to be abutted by some company, no matter how big it is or how small it is. There is no one company that occupies the face of the globe, so the mere fact of being surrounded does not mean anything.

(Discussion off the record.)

(Whereupon, the preceding question and answer were read.)

5435 *By Mr. Binford*:

Q. The description suggested by my last question was possibly erroneous in that on the west, the Appleton service area of Wisconsin Michigan Power Company is abutted by the service area of Wisconsin Power & Light Company, is that correct? A. Yes.

Q. But the service areas of those two companies are the only service areas surrounding this crosshatched Appleton area upon the map, Respondents' Exhibit No. 32, is that right? A. Unless the village of Shawano, which is shown
5436 in the upper northeast corner as being approximately on the boundary line constitutes another system, which is not in the service area, although I think it is classed as being in the service area.

Q. Well, eliminating municipally owned plants, the statement in my last question is substantially correct, is it

not? A. Yes.

Q. Now, by the service areas of what companies, and excluding municipal operations, is the combined service area of Wisconsin Electric Power Company and Wisconsin Gas

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& Electric Company surrounded, except insofar as it touches upon Lake Michigan on the east? A. By Wisconsin Power & Light Company on the west and generally on the north, except that one division of Wisconsin Gas & Electric Company abuts Wisconsin Public Service Company.

Q. That is on the north and east of Lake Winnebago, is that correct? A. Your comment applies to my very last statement?

(Discussion off the record.) 5438

The Examiner: This is a good point to stop for lunch. Let's recess until 1:30 p. m.

(Whereupon, at 12:35 o'clock p. m., the hearing recessed until 1:30 o'clock p. m. the same day.)

—2,366—

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AFTERNOON SESSION

(Whereupon, at 1:30 o'clcok p. m., the hearing resumed.)

The Examiner: Let us resume.

Whereupon, GOULD W. VAN DERZEE resumed the stand and testified further as follows:

Cross Examination (Continued):

5441 Q. Referring again, Mr. Van Derzee, to the map marked Respondents' Exhibit No. 32 and particularly to the cross-hatched area showing the territory served in Michigan by Wisconsin Michigan Power Company, in Schoolcraft County, it appears that there is an area served which also encroaches upon and in Delta County, by Wisconsin Michigan Power Company, which is wholly unconnected with any other portion of the service area of Wisconsin Michigan Power Company and which derives its power solely through an interconnection on the east with Cliffs Power & Light
5442 Company, is that correct? A. There is such a system as you described which receives its power from Cliffs Power & Light Company. That is the particular stretch of line previously described and which has not developed to a point at which we think it advisable to make any extension from the end of the present 66,000 volt line in the vicinity of Cornell in order to serve it.

It is a fact that there have been, in the past, negotiations with respect to additional loads in between the source of power at Cliffs Power & Light Company and the village of

 5443

Cooks, which if obtained on a proper basis, would materially alter the present picture and advance the time that the disconnection of this strip would be removed from the rest of the system.

Q. From whom was that small system purchased? A. The system shown from Cooks to Cliffs Power Company was not purchased in the form in which it is shown there now. I, personally, worked on this matter many years ago, when it was necessary to bring in an oil engine from Watersmeet and establish service in the villages of Garden and Cooks. 5444

The former is not shown on the map. My recollection is that it is further down the little peninsula shown to the southwest from Cooks.

Later, when the load began to grow on this small system, consideration was given to another source of supply because the oil engine source of power was getting to be insufficient, and negotiations were opened up with the Cliffs Power & Light Company from which the company is purchasing power at other points to see if a line could be extended through Manistique so as to connect with this small independent system. 5445

Finally, those arrangements were made. My recollection is that the City of Manistique gave the company the right to go through the city but not to serve in the city. That is the way the matter stands at the present time.

Q. When was that interconnection with Cliffs Power &

Light Company effected? A. I can't give you the date offhand.

Q. Can you give me approximately the year? A. I can look it up for you, but my recollection is that it was a matter of, say, three years ago or more.

Q. At that time, you evidently considered that the most economically feasible way of serving this particular small area was by an interconnection with Cliffs' Power & Light Company. That is true, is it not? A. True as far as it goes. There are a number of rural customers along this line that would take service and the point at which it was bought
5447 from Cliffs was the cheapest as far as the company was concerned as a source of power and incidentally, as a distribution line that could take care of additional customers.

It was cheaper as an expedient than any consideration of bringing a line over from Cornell or vicinity, which was the original idea in mind when we extended that line and started the development in the district of Cooks.

Q. Is the particular area served by the connection from Cliffs Power & Light Company in Schoolcraft and Delta Counties at present on a self-sustaining or paying basis insofar as monetary returns are concerned? A. We do not
5448 have separate income accounts for each small division of our system such as this. In fact, this is not a division, it is a

very small piece of line which is a part and a very small part of a very large division.

Q. So you are unable to answer the question? A. I am unable to tell you just what an income account for Cooks would look like on the bottom line, but——

Q. (Interposing) Now, that small area in turn is divided into two service areas according to this map, is it

not, with a more or less perpendicular strip of unserved territory between the segments? A. There is shown a wide open space in between the two segments of the district you are talking about. I don't know whether you are familiar with the northern peninsula of Michigan or not, but there are districts where it isn't even advisable to take out a franchise if you can get one and this may be one of them.

Q. Well, do you know whether or not that area is served with electricity by any company other than—— A. (Interposing) I can't say whether the Cliffs Company has any 5450
stray lines into that township or not or whether the Manistique Light & Power extends over the boundary line into a township and thereby obtains some rights.

Q. Manistique plant is a municipal plant, isn't it? A. No.

Q. But it is confined to the community of Manistique in general? A. In general.

—2,370—

Q. Now, other than the strip of which I have spoken, and speaking particularly of Delta and Alger counties and 5451
with territory to the north and east of the area served by the line from Cliffs Power & Light Company to Cooks, what electric service is there—that is to say, by what companies is it provided or is any provided? A. I doubt if there is very much electric service of any kind in there at the present moment. I would like to refresh my memory, however, by consulting a map of the Cliffs Power Company system if we have one.

(Discussion off the record.)

A. (Continuing) I have traveled in the district but not recently. At that time it was a very sparsely settled district. I doubt if there are many electric service customers in it now.

Q. And you can't at the present time state offhand as to whether or not electric service is provided by any companies within that area? A. I can't without reference to the latest maps showing the extensions of other systems.

Q. That portion of the map, Exhibit No. 32, showing the
5453 unhatched part of Marquette County is served by Cliffs Power & Light Company? A. Yes, that district is generally served by Cliffs Power & Light. There may be some municipal plants in there.

—2,371—

Generally, the source of power is Cliffs Power & Light Company.

Q. The unhatched portion of Baraga County is served by what company with electric service? A. There used to be a small company in there with a name something like Baraga
5454 County Light Company. That county is even more sparsely settled than some others. I have been over a great deal of it on foot, because a large area in there known as the Sturgeon River Basin contains some water power sites which the company has.

Mr. Browning: Which company?

The Witness: Wisconsin Michigan Power Company. There is a small company serving in Baraga. I believe it has connections with the old Houghton utility that serves in the City of Houghton.

By Mr. Binford:

Q. Now, there is one other line that serves solely through the connection with Cliffs Power & Light Company, which includes the community of Michigamme, apparently, is that correct? A. Michigamme?

Q. Michigamme. A. Yes.

Q. That is correct, is it not? A. Michigamme is the correct pronunciation.

Q. But the sole source of energy in that distribution 5456

—2,372—

system is the electricity purchased from Cliffs Power & Light Company? A. Yes.

Q. When was that acquired—that distribution system? A. That was acquired, I would say, approximately the same time that a number of these other small companies were being acquired in this district.

It is entirely disconnected from the balance of the system and we acquired the system because we expected that sooner or later the line would be connected between Sidnaw and Michigamme and that we would develop one of the water 5457
power sites in Baraga County and bring therefrom a line due south so as to inject a source of power into the middle of the line and between Bruce Crossing and Michigamme.

We also had in mind that at some later date we might extend a line from a point somewhere near the word "Cliffs Power Company," which appears near the letter "A" in the word "Michigan" in a general southerly direction so as to make a loop with the Cornell line, but those events have not yet taken place. The possibility of them is still in the

picture and we are waiting for the best moment and the proper moment when it can be done efficiently.

Q. Do you consider that that isolated line, deriving its sole source of energy from Cliffs Power & Light Company is in any sense a part of the integrated system of Wisconsin

—2,373—

Michigan Power Company? A. Why, I think so. Historically, it has such antecedents. It is a fact that it is connected with the Cliffs Power Company at that point. We

5459 are connected with the Cliffs Power Company at other points.

The Cliffs Power Company has discussed with us from time to time during the past years, the possibility that we would be interested in acquiring their electric distribution system and when the negotiations last were dropped, it was a question that they wanted more money than we wanted to pay, but it seems to me very evident, even if we never acquired the Cliffs Power Company that our original plan contemplated a feasible interconnection with these, what you would call, "tag-end systems" with the main body of the

5460 northern division of the Wisconsin Michigan Power Company.

We wouldn't have bought them if we had expected to operate them independently and in perpetuity.

Q. But you think it may become in the future economically feasible to connect these two isolated small systems with your own sources of power, do you? A. I think it may. At the moment, transmission lines to accomplish that are not justified and hence, the purchase of power from Cliffs Power continues to be expedient.

Q. At the moment, such interconnection would not be economical, in other words, is that true—not economically

—2,374—

feasible? A. Well, we wouldn't postpone it until the intended time in the future when we expect it would be if it were now feasible.

Q. You wouldn't say that more logically those two disconnected distribution systems would be appropriate to the system of Cliffs Power & Light Company rather than to the system of Wisconsin Michigan Power Company? A. Well, 5462
if the Cliffs Power & Light Company were giving consideration to absorbing our company, perhaps your statement might be correct.

Q. In the absence of such consideration? A. In view of the fact that future negotiations would be the other way around, I wouldn't draw any such conclusions from your question.

Q. Well, eliminating entirely the question of future consideration as to the purchase of one company by the other, now looking purely at geographical and operating facts, wouldn't it seem rather apparent that those two distribu- 5463
tion systems which derive their sole power from Cliffs Power & Light Company should be a part of that system, if a part of any system, rather than of a company with whose lines they have no interconnection at all? A. Well, I have had so many arguments with municipalities buying power from us along the same line that I don't think it follows that the

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mere purchase of electricity from some other source means that that is the place where ownership ought to rest in the interests of the ultimate customer.

Q. You think your company and your security holders—that is to say, the company of Wisconsin Michigan Power Company and its security holders derive benefit from the ownership of these two isolated distribution systems, then? A. Yes, I am reasonably certain that they are making more than their out-of-pocket expenses because the rate that we were willing to pay at the start for current was predicated on their paying their way to a degree.

I can't tell you just what that degree is, but it is not a
5465 burden on the rest of the system.

Q. Even though there is no present interconnection with the rest of the system and such interconnection is not presently practicable? A. No, they make some contribution in my opinion to the fixed charges on the balance of the system. The customers in Michigamme, as long as they are looked out for by local agents, aren't particularly concerned with whether the power comes from Cliffs Power & Light Company or some other place as long as they get good service and we see that they get it.

Q. Well, that would be true also, wouldn't it, if you
5466 owned some isolated distribution systems in Oklahoma or some such place as that? A. Well, I was pointing out that

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you have to consider these things, what the local people think. They are not crying for a transfer of this system to some other place because they think the service will be any better.

Q. Mr. Van Derzee, I believe yesterday you testified in substance that Wisconsin and Michigan rates, or the determination thereof, were made entirely independent of securi-

ties and based only on the fair value of the property which appears at page 2,212 of the transcript of record, and further amplified that statement upon the following page of the record by a statement, in effect, that the valuation of the property for the purposes of establishing a rate base was made with no relation to securities whatsoever. You were speaking from your knowledge as to what the law requires in the states of Wisconsin and Michigan in respect to the subject matter of your remarks? A. I was speaking from
my understanding of the practice that has heretofore pre- 5468
vailed as far as I know it. The usual method of determining proper rates is to examine the income accounts of the company, the revenues that are derived from the sale of the business, the expenses that are incurred and are deducted therefrom, including depreciation, so as to arrive at what is usually called net operating revenue, net operating revenue being the operating revenues minus the operating expenses.

The operating expenses must include the proper allowance for depreciation. The next step in determination of

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rates is to have an inventory and appraisal of the property 5469
which is used and useful in the conduct of the utility business. Not attempting to describe the long processes by which those are made and overhead values for construction are finally determined, the Commissions do arrive at a figure which is known in general in Wisconsin as the rate base.

That rate base is so determined—and I might say it includes a reasonable amount of working capital, materials and supplies and possibly some attention is given to going

value—that rate base becomes the denominator in a fraction, the numerator of which is the net operating revenue, in the determination of the rate of return.

If the per cent return on the fair value of the property is within the limits of fair return as so considered by the Commissions, then it is not the usual practice to make any change in rates but if the rate of return is considered to be excessive, then the changes are made so as to reduce the rate of return expressed in per cent to a reasonable figure.

5471 What I meant to indicate by my testimony was that that is the method of doing it that we have worked with and no other principles have been laid down to my knowledge that is definite in the determination, finally, of rates by the Commission, but I am well aware that some consideration is now being given around the country to covering the financial requirements, based on what you have to deduct from gross

—2,378—

income for bond interest, what you have to pay for preferred stock dividends, and what is a reasonable allowance for surplus out of which adequate common dividends can be paid.

5472 But, as far as my home grounds are concerned, that is the formula that is usually used and I think, as a matter of Wisconsin law, the Commissions are required to make appraisals of properties.

Q. Your impression of Wisconsin law and your impressions of Michigan law didn't enter into your answers on direct examination at the point indicated there? A. Not consciously.

Q. You are not a lawyer? A. I am not, but I do know that within the last couple of months a gentleman who is a

customer of the company went to the Public Service Commission and said, "How long since you have made an appraisal of the property of Wisconsin Electric Power Company?" and requested that the Commission forthwith make a new appraisal so that rates could be properly determined.

Q. In the computation of value or the appraisal of property, and more particularly in the computation of the value of additions to property after appraisal has once been made, there are problems, are there not, as possibly exemplified by you in some of your testimony yesterday or the day before, 5474
as to what items may properly be regarded as additions to

capital investment as distinguished from maintenance expenditures? A. Yes, there are borderline cases. Those cases, in sum total, however, are a very small per cent. of the continuous run of capital expenditures.

Q. But those are cases which necessarily call for not only the exercise of managerial discretion in respect of your own accounting, but also for the exercise of a quasi judicial discretion by regulatory bodies in determining the factors entering into your rates, is that not true? A. They would give 5475
consideration to those facts as to whether or not the rate base that we present as being proper is in effect the proper rate base.

I desire to mention, however, that this item of $50,000.00 that I spoke of, and which seems to be unquestionably a capital expenditure, is a very small per cent. of annual expenditures of three to four million dollars, and questions like that don't pop up every day. Our capital accounts are very thoroughly audited and we have to prove them to representatives of the Commission.

Q. From your extensive acquaintance with the operations, other than the internal deliberations, of the regulatory bodies in Wisconsin and Michigan, can you state approximately what the number of the personnel of the Wisconsin Public Service Commission is? A. The number has been changed

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within the past year and a half. There was a time, according to my recollection, when there were three or four hundred employees. At the present time there are three Commis-
5477 sioners. There is a chief engineer and there is Mr. Cobert; then Mr. Morehouse was head of the reseach division and he has left. Mr. O'Leary is now the acting head of the research division.

Surrounding Mr. O'Leary's office, I would just guess that he has four or five little offices in which, perhaps, fifteen or twenty men are located, and surrounding Mr. Steinmetz' headquarters, I would say that he must have at least thirty or forty men working on various projects.

When I see these officers, I don't see the men who are in the field and I have really no occasion to find out, nor am I
5478 curious about the exact number of employees that are working for the Commission. So what I give you is just the result of my own observations.

There is also another division that has to do with transportation.

Q. Will you please refer to your testimony on direct examination in this matter which appears at page 2,125 of the transcript at which point you stated in part, "In effect, The North American Company, over the years, has been our financial backer and as a result we have been freer to devote our

major attention to other phases of the business"? Is The North American Company at the present time the guarantor

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of any securities issued by any one of the three public utility operating companies of which you are an officer? A. I know of no such guarantee.

Q. Has it ever been such a guarantor to your knowledge? A. I do not recall at this time specific instances unless the occasion recited in connection with the 1927 financing of Wisconsin Michigan Power Company, where the parent com- 5480
pany put up, I think it was, $5,000,000.00 or $7,000,000.00 for a short period of time pending a certain transaction, could be classed as being in effect the guarantor of certain results. That was not the term that I had in mind when referring to "backer."

Q. What did you have in mind? A. I had in mind that on many occasions—for example, when Wisconsin Electric Power Company in 1920 was constructing the Lakeside Power Plant, The North American Company made advances on open account for the construction of the plant.

Q. Do you know approximately what those advances 5481
amounted to? A. They were heavy but I can't tell you just the exact amount. It is a matter of record.

Q. Do you know how much interest was paid by Wisconsin Electric Power Company upon those advances, what rate of interest? A. Generally, the current going rate of interest for loans of that type.

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Q. In that territory? A. Yes.

Q. You have an approximate idea as to what those rates of interest were at the time under consideration, haven't

you? A. I think they were in the neighborhood of $6\frac{1}{2}$ per cent., that being the time when coupon interest on the bonds of Wisconsin Electric Power Company were bearing $7\frac{1}{2}$ per cent., and the Public Service Commission of Wisconsin allowed a rate of return considerably in excess of that.

Q. You don't consider that that was a speculative loan upon the part of The North American Company, do you? A. I think that my statements yesterday with respect to the risk that The North American Company took in going
5483 into this first installation of powdered fuel bear me out in stating that along with John Anderson and Mr. Way risking their reputations, North American Company risked its capital.

Q. You mean to say risked these advances which came ahead of the preferred stock presumably and ahead of all the minority stockholders' interests? A. These were on open account without notes. In my opinion they did not come ahead of the bonds.

Q. What was that? A. These were on open account without notes.

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Q. And therefore? I didn't get your last statement. A. In my opinion they did not come ahead of the bonds.

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Q. I made no suggestion of them coming ahead of the bonds, but I did suggest that they came ahead of the preferred stockholders' interests, and, in view of that fact—which you concede to be a fact, do you not? A. Yes.

Q. (Continuing) —the risk was not one that you would call extremely hazardous, was it? A. They might not have lost the exact dollars that they advanced, but they put com-

mon stock capital into the business which might have been seriously impaired if the whole plan had not worked, and, indirectly——

Q. (Interposing) But, insofar as the advances are concerned, there was no great risk involved, was there, as distinguished from the common stock investment? A. Well, if you consider just how that money would be paid back, in the event of failure of the whole project to work, it seems to me that somewhere in the picture there is a very distinct tinge of risk in connection with the whole proceeding, not 5486 only the common stock but any money advanced to effect the ends that the common stock funds were supposed to effect.

Q. Isn't it a fact that, when The North American Company was advancing you money at that time, at approximately $6\frac{1}{2}$ per cent. interest, it was able to procure funds, which the Company so advanced, by paying merely three per cent. interest to person from whom it borrowed? A. I don't

know that to be a fact.

Q. So you know nothing of any intervening profit there 5487 secured by The North American Company without any necessary extension of its own funds? A. I am not aware of any profit having been taken through any such channel.

Q. I believe there was a statement yesterday, by you or by your counsel Mr. Browning, to the effect that even at the beginning of the century—this present century—the process of corporate simplification had been begun by what were termed the predecessors of your present companies. I assume by that, and, from the history of the acquisition of

properties by these several companies, which you have set forth, that you meant that The North American Company interests were accomplishing simplification of corporate structure by gradual absorption, throughout the area, of independently-owned companies.

Mr. Browning: Just a moment. The statement was mine and I think that probably counsel had better inquire what I meant rather than what Mr. Van Derzee meant.

5489 Mr. Binford: I believe Mr. Van Derzee is on the stand at the present time.

By Mr. Binford:

Q. I would like to ask the witness whether such a process

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of corporate simplification as I have just suggested wasn't the principal one being effected by The North American interests in the territory now served by your three companies around the year 1900, and from then on for a considerable period of time. A. As Mr. Browning stated, I
5490 didn't make the statement that you referred to, and I wasn't with the Company in 1900, and I have never been an employee of The North American Company.

I came with The Milwaukee Electric Railway & Light Company in 1913, when the original consolidation of 1896 was a matter of dim history.

I can't say, from my own knowledge, what was in the minds of the people that brought about the consolidation.

Q. But you have traced, have you not, in your direct testimony, the acquisition of properties, which has—for

the present, at least—culminated in the three public utility operating companies with which you are now connected? A. I gave the financial history, being largely a recitation of the time when the different companies were incorporated, and when they changed from one company to another, insofar as the information was available.

I did not, to my recollection, make any comments about who caused them to be combined or why.

Q. You also identified as correct the several charts on

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that subject, which were introduced in evidence by your counsel? A. That is correct. Those were prepared as the financial history of the outstanding securities, under my direction.

Q. And, as I believe you also replied in answer to a question upon the subject, from the records of the present company? A. Yes.

Q. Are you able to state whether or not those acquisitions of property were, in each instance, made directly by the company shown as the acquirer upon the several charts introduced in evidence upon that subject, or whether there 5493 was an intermediary involved? A. No, I am not.

It is conceivable that someone might have obtained an option on properties and turned it over to the succeeding company.

Q. In fact, that was quite a common practice some years back, was it not? A. My recollection is, with respect to small utility properties, that was a reputable process.

Q. My question was not whether it was reputable, but whether it was not common—that is to say, frequent. A.

Judging by the exchange of properties throughout the

—2,387—

country, from one owner to another, I think the evidence speaks for itself.

Q. And speaks in the affirmative, is that it? A. Yes.

Q. And you don't know to what extent profits were realized by intermediate persons or interests, in the acquisitions of these numerous properties? A. No, I do not.

Q. Or whether such profits were realized by persons
5495 affiliated with The North American System or not? A. I have no knowledge on that subject.

Q. In the course of your dealings with the Wisconsin Commission, have you been required to—and by "you", in this particular instance, I mean the three companies of which you are an officer, or any one of them—to write down values assigned upon your books to properties acquired? A. I think a part of the testimony I gave with respect to the Commonwealth Power Company indicated that a figure of $1,400,000.00 was changed to $1,200,000.00 by the Commission in connection with its approval of a certain transaction.
5496 Perhaps the best evidence of the over-all result in that connection may be a comparison of the book values and the amount of property which, by request of the Commissions, we have worked up to be assigned to Account 105, so-called, in the Federal Power classification.

—2,388—

Q. But, of your own recollection, that is the only instance that you recall? A. If you would like to have——

Mr. Binford: (Interposing) Please read the question.

(Whereupon, the pending question was read by the reporter.)

The Witness: I recall an instance in connection with the purchase of Wisconsin Public Utility Company in which the Commission required that the company amortize out of operating expenses the amount of approximately $20,000.00 a year of the purchase price for a period of years and that another relatively small amount——

Mr. Binford: (Interposing) Off the record. 5498

(Discussion off the record.)

The Examiner: Better read it. I don't think the witness had finished his answer to that.

The Witness: No, I was in the middle of my answer.

(Whereupon, the statement of the witness was read.)

The Witness: (Continuing) ——be charged to surplus. I also recollect that there was some discussion 5499
with the Commission in connection with the authorization of the purchase of the Carey Electric & Milling Company, but I do not recall what the end result was.

A few minutes back, I made the statement that I thought that reclassification of property, as required by the Wisconsin Commission, and also for certain companies by the Federal Power Commission, had

given some figures which might be useful in connection with your question.

Account 104, as I recollect it, is supposed to contain such amount of the total property account as represents the excess of book cost over historical cost. Account 105 is supposed to contain the amount of any write-ups of property that have occurred.

In the case of Wisconsin Michigan Power Company, the figures which have now been determined as
5501 chargeable to Account 104, are a red figure of $320,292.66. That is a very unusual entry, as you will all recognize, to Account 104.

It means that original cost for the property was in excess of the books by $320,292.00.

The amount which has been worked out for Account 105 for Wisconsin Michigan Power Company is $273,410.84. For Wisconsin Electric Power Company, the excess of books over historical cost, chargeable to Account 104 is $452,490.61 and at the time that these figures were prepared there was——

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By Mr. Binford:

Q. (Interposing) Will you please give the date as of which those figures purport to reflect the data therein? A. January 1, 1938. And as of that date, the amount then segregated out of the property account of Wisconsin Electric Power Company to Account 105 was $18,544.27, which amount has subsequently been eliminated by charge to surplus so that there is no write-up on the books of Wisconsin

Electric Power Company.

The charge to Account 104 which has been worked up for Wisconsin Gas & Electric Company is $130,541.25, and there is no amount chargeable to Account 105.

These amounts, as contained in the reports prepared pursuant to orders of the Public Service Commission of Wisconsin, have not been formally approved.

I think that there is extraordinary significance to be attached to the small amount of entries to be made in Accounts 104 and 105.

Q. Of course, the accounting figures which you have given 5504
are figures as of the day indicated and do not in any way reflect what write-ups there may have been in the past that may have been eliminated in the past, do they, but only what remain unaccounted for or to be accounted for? A. Figures are as of the date for which they were asked.

Q. And for the date which you stated? A. Yes.

Q. The Wisconsin Electric Power Company now has outstanding one class of preferred stock, is that correct? A. It has outstanding 6 per cent. preferred stock issue of about 1896, which we refer to as 6 per cent. preferred capital
stock. 5505

Q. Which is non-callable? A. Which is non-callable.

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And an issue of 4¾ per cent. preferred stock which is callable.

Q. That is as shown by Respondents' Exhibit No. 45, in this case, which shows that of the 6 per cent. preferred on June 30, 1940, there was outstanding stock to the amount in par value of $4,450,800.00 and of the 4¾ per cent. series there was outstanding, as of the same date, stock to the

5506 par value of $26,209,800. Approximately when was the $4\frac{3}{4}$ per cent. series preferred stock last mentioned issued and sold? A. Early this year, in the late spring, as I recollect.

Q. And it was marketed, was it not, with the aid of local Wisconsin security dealers? A. It was.

Q. And without the intervention of any New York or out-of-state dealers? By "out-of-state" I meant outside of Wisconsin or Michigan. A. The underwriters of the portion

5507 of the stock not exchanged were entirely Wisconsin underwriters. You understand, of course, that there was no new money that went into the company in connection with this issue of stock and that it had a decided difference from other financial transactions involving large issues of bonds.

Not only in the respect that no additional money was put into the property, but the fact that the existing outstanding preferred stock, namely, the issue of 1921 6 per cent. was widely held in the locality——

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5508 Q. (Interposing) By the "locality"—— A. (Continuing) —and it was considered that the local underwriters were, in this particular instance, particularly well qualified to make the exchange because of their intimate knowledge and acquaintanceship with the holders of a very substantial amount of the stock to be called in.

Q. And that exchange and sale was successfully carried through by the local underwriters, was it not? A. It was.

Q. Common stock, as of the same date, is shown by the same exhibit to have been outstanding in the amount of

$13,959,280.00 par value. That is correct, of course, is it not? A. Yes; 1,395,928 shares outstanding, $10.00 par value.

Q. Where is the 6 per cent. non-callable preferred stock of Wisconsin Electric Power Company principally held geographically speaking? A. That stock, as you know, is a very old stock and it has come into the hands of a good many investors who keep the investment—universities, trust funds, where it is legal that it be used—and The North American Company has an amount which I do not recollect offhand, but it is a rather substantial amount. 5510

Before the refinancing referred to, I believe, if I recol-

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lect correctly, that there were considerably under a thousand stockholders owning this stock. There are a great many small amounts in Milwaukee.

Q. Now, in respect to Wisconsin Gas & Electric Company, the preferred stock of that company is very largely held in Wisconsin and Michigan, is it not? A. It is.

Q. Was that stock—that is to say, the presently outstanding preferred stock of that company—recently issued in replacement of pre-existing outstanding preferred stock? 5511
A. Yes, in the early part of 1939, if my memory serves me correct, the plan to refinance the preferred stocks that were callable of all three companies was considered more or less as a unit.

They were all of the same type. They all involved widespread ownership by residents in the communities served by the company and in the State of Wisconsin and Michigan and, hence, approximately the same general procedure was adopted. Not only was no new money involved on refinancing

here from the standpoint of getting it from the sale of stock, but you will note that the amount of outstanding preferred stock of Wisconsin Gas & Electric Company decreased in connection with getting a bank loan.

Later in the year, about in December, after finishing Wisconsin Gas & Electric Company matters, Wisconsin Michigan Power Company preferred stock was refinanced.

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5513 Q. In each instance—that is to say, the case of Wisconsin Gas & Electric Company, the case of Wisconsin Electric Power Company, and the case of Wisconsin Michigan Power Company—the refinancing was effected through local underwriters, is that not true? A. That is correct, and for the particular reasons stated. There was, in effect, no new money going into the business and it was a question of dealers and their salesmen who knew the clientele, talking to them personally and getting the exchange and the stock called and making sale of the new stock, as the case was.

5514 Q. Now, in respect to such unsecured promissory notes, or bank loans, as were effected in these three transactions, or any one of them, isn't it true that such loans were effected primarily through the personal efforts of Mr. Way, the president of your company? A. In the case of Wisconsin Gas & Electric Company and Wisconsin Michigan Power Company, the amounts involved were within the capacity of the local banks to handle and the records will show that the money was obtained locally and on reasonably good rates of interest.

In the case of Wisconsin Electric Power Company, where the requirement involved, as I recollect it, about fourteen

and a half million dollars, it was necessary to effect the loan in the east.

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This was done through a syndicate headed by the Chase National Bank. I recollect that one of the Chase National Bank men came out and very carefully examined the property. I took him around and showed him the property at that time, and in answer to your question, while I don't know of my own knowledge what the extent of negotiations on that interest rate were by any of the financial men in 5516
The North American office, I am sure that Mr. Way had something to do with it.

Q. Was a finder's fee, so-called, paid in connection with the obtaining of that loan? That is to say, was compensation paid to someone for their services in connection with the negotiation or procurement of the thirteen million plus loan? A. Well, I testified that I was not a financial expert and didn't handle these matters personally. I recollect that there was a disputed finder's fee to be paid to a financing house in the east. 5517

Q. Dillon Read & Company, would that be the house? A. That sounds like the name. And I believe that that fee was finally allowed after consideration by the S. E. C.

On that point I am not certain, nor do I know the amount of the fee at the moment.

(Discussion off the record.)

By Mr. Binford:

Q. I believe you stated as a part of your reply to the

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last question that you did not regard yourself as a financial expert? A. That is right. I might say that there are varying grades of financial experts which go all the way from a good working knowledge of what makes the financial clock tick to the specialists that go considerably further. Just where I fit in that picture, I can't tell you at the moment.

Q. Did you take part in any negotiations in New York with relation to any recent financing of any of the three
5519 companies with which you are connected? A. I attended a board meeting at New York at the time of the closing of the bond sale in the amount of $55,000,000.00 to the underwriters.

That was in 1938, sometime in October. I went there as a director to make a quorum in order to facilitate the handling of certain matters that were necessary, incident to the closing operations.

Q. That was of the company now known as Wisconsin Electric Power Company, is that correct? A. Yes.

Q. Who was the principal underwriter of that $55,000,-
5520 000 issue? A. Dillon Read & Company I believe was the principal underwriter.

Q. Did you participate in the selection of Dillon Read &

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Company as the principal underwriter? A. No, I did not. I had nothing to do with it.

Q. Have you anything that you would care to add further in regard to any financial assistance that may have been lent to any one of your three companies by The North American Company?

Mr. Browning: By that I take it counsel means add to testimony on both direct and cross?

Mr. Binford: Yes.

The Witness: I think I covered the subject generally yesterday and cited a typical example of financing in 1927 of Wisconsin Michigan Power Company, which I worked on to a certain extent at the Wisconsin and Michigan end.

I think the record would show, if it were possible to bring on to it, all the transactions that occurred of 5522 a similar nature, that it would be a very voluminous record indicating continued cooperation in financial matters.

By Mr. Binford:

Q. Principal offices of The North American Company are located in New York City, are they not? A. Yes.

Q. When did you last visit those offices? A. At the meeting which I referred to of the operating executives which I think occurred in May or June of this year.

Q. And previous to that, what was your latest visit to 5523

those offices? A. I would say that I was at the offices once or twice a year on some matter or other.

Q. Did you make a special trip to New York for that purpose or was that incidental to a customary annual or semi-annual trip to that part of the country on your part? A. No. The visit in the spring was particularly for that purpose and my visits are usually for that purpose. My friends in New York complain that I came down there to

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go back on the next train or shortly thereafter and they never see me.

Q. I believe you testified, in substance, upon direct examination that in the absence of such competitive incentives as may be furnished by your competition with your fellow companies in The North American System, there is an inherent danger of stagnation in the operation of a business such as that conducted by the three companies with which you are connected. You believe that to be true, do
5525 you not? A. Yes, I believe that to be true. I can't name you the exact degree of inherent stagnation but it exists very definitely.

Under the stimulus of what your brothers and sisters are doing, you are put on your toes to do better yourself. I think I recited the case of the St. Louis people coming to Milwaukee recently on their return visit where they were to find out why our billing costs were less than theirs and the comment that I made to Mr. LaPorte, which doesn't

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express in the record the determination, vim and the vigor
5526 with which he said, "Leave it to me," when I asked him, "Are you going to let them get ahead?"

Now, if some other company had come and looked at our billing records and some remark had been dropped about "Are they going to exceed your records," I know as well as I am sitting here that you have got no such response as that.

Q. Are you at all familiar with the Detroit-Edison Company or its operations? A. To some extent. Not particularly. I recollect having visited there about 1916 to find

out, in connection with a trip I was making, what they were doing to ration power. That was in a time of power shortage.

I have seen, but I wouldn't say that I know Mr. Dow very intimately. I met Mr. Savage, Mr. Marshall, Mr. Snow.

Q. These gentlemen you have mentioned are or were officials of the Detroit-Edison Company? A. I can't say as to whether Mr. Snow is an official but Mr. Dow was the president. I don't know what position he occupies now. Mr. Marshall is one of the top officers. I don't know what Mr. 5528
Savage's position is or whether he is still with the company.

Q. Do you feel that your knowledge of that company is sufficient for you to say whether or not you would regard it as

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a stagnant company? A. I think my knowledge, including a certain amount of hearsay, is sufficient to say that it has a good reputation. I have never heard of it defined as a stagnant company.

Q. Does it participate, as far as you know, in the competitive endeavors which you feel are common to North American subsidiaries? A. It has membership on the—or 5529
at least is on the committee of operating engineers, intercompany station advisory committee, so-called, and I believe that it has a representative on the electrical committee.

I didn't see the representative from Detroit on the accounting committee.

Q. The accounting committee is the one recently created, is it not? A. Yes. I would like to add that there is a certain degree of financial interest on the part of The North American Company in the Detroit Edison Company which may be related to the participation on the committee.

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Q. Do you feel that, possibly, the participation of that company, namely, Detroit Edison Company in these intercompany activities has aided it in escaping stagnation? A. Well, if they had their ears open, it would be very helpful to hear what goes on.

Q. Do you know the name of the principal electric public

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utility serving the City of Chicago? A. Commonwealth Edison Company.

5531 Q. Is that it? A. I believe that is the name of it.

Q. That company is not at present a part of any holding company system, is it? A. I have no information on that. I doubt that it is.

Q. Would you characterize that company as stagnant? A. No.

Q. Do you know what company serves principally the City of New York with electric service? A. Consolidated Edison.

Q. That company is not part of a holding company system, is it? A. I can't answer that.

Q. Do you know enough about that company to say
5532 whether or not you would consider it stagnant? A. I really know very little about it with the exception that I have heard their residence rates are not as low as some in the middle west.

Q. Do you know what electric public utility company serves the City of Boston? A. I believe it is the Boston Edison.

Q. That company, likewise, is not a part of any public utility holding company system, is it? A. I can't answer

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that.

Q. Are you sufficiently familiar with the operations of that company to be able to express an opinion as to whether it is stagnant or not? A. I really have no information with respect to its degree or lack of stagnation.

Q. You do concede that it is possible for a company—a public utility company—independently owned, to be operated progressively and not to stagnate, do you not? A. I don't know any reason why, with proper circumstances, it ought not to be progressive, but I am not attempting to pass on how much more progressive it would be if it had the facili- 5534
ties of family relationships of people in the same business.

Q. Would you say, along that same line of reasoning, that the ultimate good in this direction would be accomplished by a single holding company system for all the major utility companies of the United States? A. No. Then you get into meetings of the intimate inter-company committees which become conventions and I have previously described why you can't get much out of a convention.

Q. Where would you draw the line at the size of such associations? A. My experience goes only to the size of
the committees of the inter-company group of North Amer- 5535
ican Company.

I can't say what would happen with considerable enlarge-

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ment in the size of the committee because I have no experience but I think it is true that if you attempt to add too many members, you lose some of the intimacy and close touch and ability to go through with a single subject to conclusion.

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By Mr. Binford:

Q. Would you say then, in your opinion, the decrease in the number of companies participating in these activi-

ties would result in a loss to the remaining members, while any increase would tend to make the organization too large for efficient operation? A. I don't think you could measure it with such a fine micrometer as the word "any" and I am not prepared to testify as to the shades of difference that would result from subtracting one member or adding one member, but I would hazard a guess that if you made the Committee five times as large it would be unwieldy.

Q. But as it is, you feel it is just about a satisfactory
5537 size organization? A. I honestly feel that a great deal of good results from the present organization.

Q. Will you please turn to page 2210 of the transcript of testimony in this case? Reflecting your testimony of day before yesterday, the page in question shows the question:

"Well, do you have paper profits between your companies?"

And your answer:

"We have no paper profits."

Did you mean to assert that there are no profits realized, for example, by Wisconsin Electric Power Company in the
5538 sale of electricity to the subsidiary Traction Company? A.

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It may be that we did not have a meeting of minds on what paper profits are. In our business we talk about a rate of return and when we get a rate of return we don't assume we have made any profit. If we have earnings in excess of rates of return, in our office at least, we begin to think that some profit has been made, that is in excess of reasonable rates of return. I didn't intend to indicate that there was not some

return on the investment of Wisconsin Electric Power Company devoted to serving the electrical needs of the Transport Company. That was not in my mind.

I had the also perhaps incorrect understanding that this was in some way associated with, not what might be termed "watered stock", but some iniquitous practice of injecting into a transaction an illegitimate profit.

Q. But there are profits realized by your individual companies within the group from dealings with one another, are there not, which you do not regard as iniquitous? A. 5540
With your definition of profits being the same as mine, namely a rate of return that is reasonable on the investment serving the other company, I will say that we do get, after operating expenses and depreciation, solely on the investment required to serve the affiliate, if that is a profit, then we make a profit.

Q. But insofar as under your system your allocation of costs is true, you endeavor to realize only what you regard

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as a just and reasonable return? A. That is it, and the contract under which we render that service has been in- 5541
dividually approved by the Public Service Commission of Wisconsin. They are generally found to be on a cost basis, the cost making allowance for such return as is necessary.

Q. I believe you stated earlier during the course of this cross-examination, that you were not present at the time of the giving of the testimony relative to the operation of the Cleveland Electric Illuminating Company, nor had you read the transcript of the testimony taken at that time. That is true, is it not? A. It is.

Q. You know, do you not, that the Cleveland Electric Illuminating Company does not operate transportation facilities in its territory but sells electric current to a separately owned transportation organization? A. I believe that is the arrangement.

Q. Have you any knowledge of the situation existing in any city where there is a separation of ownership of the electric transportation operations and the electric lighting and power operations? A. As to what point?

5543 Q. As to the manner in which the independently-owned organizations cooperate in carrying on their respective ser-

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vices to the public. A. No, I have no knowledge of that kind.

Q. Then, as far as your experience is concerned, you do not have sufficient facts, do you, to be fully informed as to whether such an arrangement could be carried out in respect to the Transportation Company and the Electric Power Companies in your associated group should the Transportation Company become independently owned? A. I would like to have you read that again.

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(Whereupon the pending question was read.)

The Witness: What do you mean by "such arrangement"?

Q. Such as existed in Cleveland and in other cities where there is cooperation between electric power companies and electric transportation companies which are not jointly or commonly owned.

Mr. Browning: Mr. Examiner, I submit that there is nothing in this record showing any arrangement

between electric companies and transit companies except as regards Cleveland and Washington, and other than Milwaukee, and that counsel's characterization of the Cleveland situation is slightly lacking in definiteness and perhaps even accuracy.

Mr. Binford: I believe the question is still proper, whether there is anything in the record about the subject at all or not. The witness has stated, in effect, that he is not familiar with any such situation anywhere. I am merely asking him if, in view of that 5546

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fact, he still feels that he has facts within his possession so that he is sufficiently informed to know whether or not his companies could do as companies in other cities have done where such a situation does exist.

Mr. Browning: My objection or difficulty with the question is the last part of it. It seems to assume that there is some common practice in all other cities between all transit companies and all electric companies. I not only don't know that it is the fact, I 5547
know that it is not the fact.

Mr. Binford: I disclaim any attempt to have such an assumption in the question.

Mr. Browning: Perhaps we could simplify the question a little.

The Examiner: Let's go off the record and see if you can't get that question simplified and submit it to the witness.

(Discussion off the record.)

By Mr. Binford:

Q. I will try to rephrase the question. Since, as I understand it, Mr. Van Derzee, you have had no acquaintance with the relations existing between an electric power company and an electric transportation company in any city in which those two companies were not owned in common, do you feel that you are sufficiently informed to give an opinion

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as to how the situation would work out in your territory
5549 if the Electric Transportation Company were owned by someone who did not own nor control the Electric Power Companies? A. That is a difficult question to answer in one sentence. It really requires a review of the number and character of all contacts that Wisconsin Electric Power Company has with The Milwaukee Electric Railway and Transport Company, the examination of the basis of each one, on the strength of which individual analysis conclusions could be reached with respect to that one as to whether I thought if the Transport Company were separate they would get as good a deal on that particular thing as they now get,
5550 and as I have explained in detail in connection with the tie-ins between the Electric and the Railway property, but I will give you one example and I can give you a number more. That relates to the Power contract between Wisconsin Electric Power Company and The Milwaukee Electric Railway and Transport Company.

I don't know whether Mr. Schmidtman made any explanation of that contract or not, but the rate for power contained in that contract is a basic rate of .78¢ per kilowatt hour. That covers the delivery of direct current

service. That means that in the ownership of Wisconsin Electric Power Company must rest all of the power production apparatus required to deliver 600 volt service at the

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trolley. That means that the rotary converter sub-stations must be included in the investment of Wisconsin Electric Power Company.

Those familiar with the rates for electric power would know that a rate of .78¢, with minor adjustments up or 5552
down, depending on labor and coal costs, is a reasonably low rate. I don't have the figures charged by other companies, but I heard some of them at the time this matter was being discussed with the Public Service Commission of Wisconsin; my impression is that it is below the average, and that it is probably not common practice to sell direct current service, although some may do it.

In the analysis of the component parts of the cost of power charged by Wisconsin Electric Power Company to the Transport Company is a rate of return on the investment used, which we know and the Public Service Commission 5553
knew, was below the average rate of return charged on ordinary business, but here we were, with one company doing all the business, the formation of a subsidiary to take over the transportation business and the necessity on the part of that subsidiary of having electric power at a reasonable rate.

I think I could say that if the Transport Company were owned by outside interests and they paid us off, that it would be very unlikely that we would invest in sub-station

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equipment necessary to convert alternating current into direct current and make a rate anywhere near what we have made.

The relationship between the Transport Company and the Electric Company is naturally a very close one. We want to see it succeed, not at the expense in any way of the Electric Company, but we want to get a return on our investment some day in it if we can. We want to be assured, if we can, that the bond interest will be paid.

5555 The Public Service Commission took into account all of the various aspects of the case when what they thought was a relatively low rate was finally approved.

We have just hosts of other extremely intimate contacts with that company. We operate the telephone system for them. I can't imagine another company operating a telephone system for a transport company just because it is our practice with this familiar arrangement to do things best where they can be done best. That left the telephone system with the electric company.

5556 Ordinarily an independent railway company would have to have its own dispatching telephone system. The Railway Company uses thousands of feet of duct which were all left in the Electric Company when the separation was made.

They use certain rights of way which have been retained by the Electric Company. They use buildings which are owned by the Electric Company. There is an intimate con-

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tact in that way which I would question whether any independent companies would tolerate.

The agreement on the rate of return for the rental of these buildings, and right-of-way and tracks which were still used, which we own, is a basic rental of about 1½ per cent., which varies with the prosperity of the Transport Company. If the Transport Company should earn 3½ per cent. on its own investment, then the return element in the rental for property used by the Transport Company which belonged to the Electric Company would be increased.

I doubt if an outside company, having received its money for its transportation property, would have any notion that 5558 it was up to it or that it would gain any benefit in codling along an operation of that type in the public interest. It would, in my opinion, say, "Well, boys, they have got to have electricity to run the cars or there is going to be no more service. If we are going to make an investment in all this special equipment for a long term of years required only for the railway, we are going to get our amortization costs added on to normal rates for power."

If the separate transportation company wanted to use the duct of the electric company and separation had been 5559 made such as ours, with the ducts all left, certainly that independent electric company would be in a fine position to make a nice trade and it would not be so concerned about getting a 1½ per cent. return so as to foster the business of the trans-

port company, because it would not be worried about getting interest on the bonds of the transport company. It would not be in the position of an owner of a wholly-owned subsidiary.

I could give you examples of joint benefits, I believe, under the present arrangement which nobody would have the patience and time to work out if it was a separate electric company and a separate railway company. Why, we make out the payroll checks for the Transport Company employees because we have facilities for doing it and were doing it when the separation was made, and we do it more cheaply because we have the joint facilities, and decreased unit costs go along with increased volume.

5561 Can you imagine our making out the payroll checks for the Milwaukee Gas Light Company, or doing any one of a hundred intimate operations which they have done for us, which they would not listen to if they were separate?

I could go on about the use of our poles, the reasonable rental charges that do not impose any burden on us but give us some return.

Mr. Binford: Pardon me. Mr. Examiner, I don't like to interrupt the witness, but I believe that these interrelations between the companies were covered
5562 rather fully the other day on direct examination and I would like to have the pending question read, and I don't believe the answer has been responsive to the question.

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The Witness: I think that the things I have said all relate to the very heart of the question, that the things that we do, and I know we do, would not be done if they were separated. That is the whole question.

Mr. Binford: May I have the question read?

The Examiner: Yes.

(Whereupon a short recess was taken.)

The Examiner: Shall we proceed?

(Whereupon the pending question was read.)

Mr. Binford: I submit, Mr. Examiner, that that can be answered, yes or no.

Mr. Browning: I think the question may be confusing, but as I understand counsel, it is to the effect 5564
of whether the witness considers himself qualified by his experience.

Mr. Binford: Yes, in the absence of outside experience.

The Witness: Yes, I think I am qualified to talk about what would happen if the transportation business were separated completely in Milwaukee from the electric business and there was no common owner.

By Mr. Binford:

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Q. Despite the fact that you have never operated a utility in a city where that situation existed? A. Yes, I think so. You don't, I believe, have to have operated a utility to break down the important contacts that would exist after separa-

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tion into their component parts and to compare the benefits that are now being received with respect to those component parts with what could normally be expected in any other place, and when you analyze the situation that we have and find conditions that benefit the Transport Company that are

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even a strain on the imagination, such as our making out the payroll checks for the Transport Company, that is just one of a number of cases which, when they multiply as they have in our company, indicate to me that I know enough about this subject to state very flatly that it would not work if we were to separate the Transport Company and the Electric Company in Milwaukee at this time.

Q. I conclude from your general testimony, Mr. Van Derzee, that you believe that in your business the problems
5567 involved in any particular locality, such as the one served by your companies, are so peculiar to themselves that experiences of other companies in other localities is of very little value in arriving at solutions to your own problems. Is that correct? A. No, it is not quite correct. I look at it this way, that it is unlikely that a company which is dealing with another at arm's length is going to make any particular preferential rate, because it has no particular reason for it, that an independent electric company in another city is not going to do a tremendous number of intimate operations for the

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5568 independent transport company and at extremely reasonable costs.

There is no particular reason for it. As I stated, the only reason for bringing out a number of specific instances where we do what I think is away out of the ordinary, is to show that in our particular case, if we had the separation, the Transport Company could not expect the same deal it gets now married to us.

I can tell you flatly, with respect to our company, that we would not do all these things that we now do and I don't

know any other better source of information with respect to the Milwaukee property.

Q. The relations between your electric power companies and the electric transport companies are, however, the subject of State Commission regulations, are they not? A. They are.

Q. Do you think the rate of return and the reasonableness of the arrangements made, insofar as approval by the regulatory body is concerned, are affected by the fact of
affiliation? A. Yes. 5570

Q. You would say that—— A. (Interposing) The history of the regulation of The Milwaukee Electric Railway and Light Company is a long history of what is called joint regulation. It is a matter of public records, and the Com-

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mission has so stated that in the past, prior to the separation of the two services of the Company. We are more or less regulated together. They recognize the very important aspect of public convenience and necessity with respect to transportation service. They knew that we had a $1.00 pass fare
system that produced very good results and that the public 5571
was just married to the $1.00 pass. Anything that would be done to disturb the $1.00 weekly pass in Milwaukee would be very serious.

Now, since the companies have been separated, as of October, 1939, joint regulation has to some extent continued to go on. When the Commission sent us a notice not long ago giving the return on the electric and railway business, they put a third column in which was the joint return. On account of the history of the situation, they did not want

to disturb any more than they needed to the old policy of joint regulation.

You may know that they permit that the arrangement agreed upon by the bankers that $1,250,000 is set up as a reserve against possible losses in the transportation business after preferred dividends and 1 per cent. return on common stock of the Electric Company.

To a certain extent that is a continuation of joint return. I think that regulation in Wisconsin is keenly conscientious
5573 of the fact that practically the same problem exists, namely

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to give Milwaukee and suburbs good cheap railway service and good cheap electric service together, as existed before the companies separated; so when I tell you that they allow these low rates of return on property devoted to the transportation business, you can understand from what I have said that there is some reason for it.

We, however, have to be a party to that low rate of return, and if you separate the properties, we don't.

5574 The Examiner: Was it 1938 or 1939 that you made the change?

The Witness: October, 1938. I think that is what I said.

By Mr. Binford:

Q. Is it not true, Mr. Van Derzee, that the laboratories of your companies test fuel for companies not in the North American system, and do other testing and reporting work for companies outside the system? A. We have a very small physical and chemical laboratory that grew up almost en-

tirely for the purpose of supplying the needs of the various departments that purchase supplies. Coal is tested for the company. Various kinds of cloth and textiles are tested. Soaps that we use around the building are tested.

Incidentally, on account of the facilities being available, we have done a small amount of outside testing work. We have done some testing, as I recollect it, for the city,

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in connection with concrete work. Whether or not we do 5576
any coal testing for anyone else, I don't at the moment have the information, but the total bottom line figure on the special account for the whole chemical and physical laboratory for the month is of the order of about two or three hundred dollars. It is a mere fly speck.

Q. In testifying day before yesterday, you testified, as it appears upon page 2,189 of the transcript of record, at the top of that page, to the effect that the important observation that one could make by looking at the table there referred to, which was Exhibit No. 47 of the respondents, was that Wisconsin Gas and Electric Company "was last able to finance 5577
its requirements by the sale of bonds at a rate of 3½ per cent., a material reduction from the high of 6 per cent."

I believe that that statement was possibly clarified by a question which I asked in connection with the Exhibits. You were referring there, I take it, not to any exact saving in cost of money to the company, but to coupon rates, is that correct? A. Yes.

Q. And one is not to draw the conclusion from the Exhibit nor from your testimony, that there was any saving in the actual cost of money to the company bearing any par-

ticular relation to the figures given, in view of the fact that the discount and premium are not shown? A. I was not at-

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tempting to indicate that the saving in dollars of bond interest to service this debt immediately before the refinancing was 6 divided by $3\frac{1}{2}$ times what it was after financing.

Q. Well, what did you mean when you said in the transcript at page 2,189, "But the important observation that one can make by glancing at this sheet is that the company
5579 was last able to finance its requirements by the sale of bonds at a rate of $3\frac{1}{2}$ per cent., a material reduction from a high of 6 per cent."? What was the importance of that observation? A. I was commenting on the drop in the cost of bond money from the highest that the company had ever paid down to the lowest, showing the trends of money rates and the progress that the company had made, obviously, with its credit; that the company, now obviously in a good market, sell its bonds at a $3\frac{1}{2}$ per cent. rate.

Q. You were not, however, intending to imply that the credit of the company had so materially improved that upon
5580 a comparable quality and market of comparable bond prices, the relationship of the improvement is reflected by the $3\frac{1}{2}$ and 6 per cent. figures? A. No.

Q. You realize that there have been recent instances of public utility bond offerings absorbed at a yield of approxi-

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mately 2.8, do you not? A. At the present time, but this was in 1936.

Q. Are you able to state, of your own knowledge, without reference to notes, approximately what the actual yield

to the purchaser, upon the initial sale of the $3\frac{1}{2}$ per cent. bonds, the $3\frac{1}{2}$ per cent. coupon represented? A. That was the transaction of four years ago. I think I testified that I did not handle the intricate financial arrangements that the company made. If it is a figure that you desire, I can readily procure it.

Q. Well, it is true, is it not, that the difference in the price of money, as reflected in bond prices, and in bond coupons, is an important factor in the rate at which your company or any other company can borrow money on bonds? 5582
A. Will you read that?

(Whereupon the pending question was read.)

Mr. Binford: I want to add to that; at one time as distinguished from another time.

The Witness: Well, the rate at which the company can borrow money, of course, depends upon the general level of the cost of money in the market and whatever the company is able to do in that respect is reflected by the credit, and if it gets a low rate, it is an important thing to the company. 5583

By Mr. Binford:

Q. But you don't claim for the companies any particular

—2,422—

credit for the bond market being high at any particular time, do you? A. I would not say that they had anything to do with the bond market being high.

Q. Now, will you please glance at the transcript of your testimony on page 2,218 of the transcript of testimony in

this case. At that point you stated that you participated in a rate case before the Public Service Commission of Michigan, "probably as far back as 1925", and that one of the things you remember particularly about that case, which seems strange at the present time, was that the Commission "thought perhaps the depreciation was a little bit low and agreed that after earning 8 per cent. on the investment we would have to put the balance in depreciation reserve until a certain figure was reached". You added to that, that
5585 "such conditions, of course, were far away and long ago."

From your experience before the Public Service Commission of Michigan, are you able to state when the change of attitude of the Commission in respect of the point at which depreciation could be taken as before or after return on the investment was made by that Commission, if it has changed its attitude? A. No, I can't tell you. As I pointed out, this was probably a peculiar incident in the history of early regulations in the State of Michigan. I am sure from what I hear now that they are undoubtedly pretty well

—2,423—

5586 lined up with the 6 per cent. idea with a number of the other commissions. I am also reasonably certain that most commissions in our immediate vicinity require adequate depreciation before any dividends are payable and before any pre-determined reasonable rate of return is allowed. I mention this merely as an historical curiosity and not as something that was intended to convey the present conceptions of anyone.

Q. The year 1925, mentioned, though, as being the probable year of the happening of that incident, is correct, is

not it? You say, "probably as far back as 1925"? A. Yes, and I did that because this was a Peninsular Power Company case and I could not have been interested in it until our interests became interested in it.

Q. Which was in 1925? A. That is my recollection.

Q. So that it might have been any time thereafter but not theretofore? A. It was very early in the operations and I think it would be at the other end of the period.

Q. At least you would be of the opinion that it was before 1935? A. I would say perhaps 10 years. 5588

Mr. Binford: Mr. Examiner, I have no further questions in cross-examination of Mr. Van Derzee at this time and I do not expect to have any further

—2,424—

such questions, but I wish to reserve the right, as in the case of other witnesses, to recall him for further cross-examination should the latter appear appropriate.

Mr. Browning: It is understood, as usual, that we do not concede that right.

The Examiner: Well, have you any further examination, Mr. Browning? 5589

Mr. Browning: No, Mr. Examiner.

The Examiner: All right, you may be excused, Mr. Van Derzee.

(Witness excused.)

Mr. Browning: We now wish to move for adjournment of this hearing until Monday morning, October 21. We have finished with this testimony in regard

5590

Colloquy

to the Wisconsin-Michigan group of companies and will expect to proceed with another group of companies, in all probability the Union Electric Company of Missouri and its subsidiaries. That is an extensive system, the largest group of properties in some respects that we have had yet to consider, and we will require such an adjournment for adequate preparation.

(Discussion off the record.)

5591 The Examiner: Very well, this matter is now continued until October 21, at 10:00 o'clock a. m.

(Whereupon, at 4:20 p. m., the hearing was adjourned until 10:00 o'clock a. m., Monday, October 21, 1940.)

—2,425—

5592

BEFORE THE 5593

Securities and Exchange Commission

Docket No. 59-10

IN THE MATTER

of

THE NORTH AMERICAN COMPANY, *et al.*

--- 5594

Hearing Room 1102-A,
Securities and Exchange Commission Bldg.,
Washington, D. C.,
Monday, October 21, 1940.

Met, pursuant to adjournment, at 10 o'clock a.m.

Before: W. W. SWIFT, *Trial Examiner.* 5595

Appearances:

S. PEARCE BROWNING, JR., and CHARLES S. HAMILTON, JR., of Sullivan & Cromwell, 48 Wall Street, New York City, Attorneys for the Respondents.

RALPH C. BINFORD, ARTHUR J. BUSWELL, and E. M. CALKIN, Attorneys for the Securities and Exchange Commission.

PROCEEDINGS

The Examiner: The hearing will come to order.

Mr. Hamilton: Mr. Stokes.

Whereupon, STANLEY STOKES called as a witness on behalf of the Respondents, being first duly sworn, was examined and testified as follows:

Direct Examination by Mr. Hamilton:

5597 Q. Will you give your name and address to the reporter? A. My name is Stanley Stokes, address 7171 Washington Avenue, University City, Missouri.

Q. And will you state your present connection with Union Electric Company of Missouri, and its subsidiaries, and also outline your experience, your business career, with those companies? A. My present position with the Union Electric Company of Missouri, and subsidiaries of that company, is that of consulting electrical engineer.

In that capacity we have a department of engineers there who supervise the major developments in the system en-
5598 gineering. This includes planning for power plant requirements, main system changes of any kind to take care of the growth of load.

I came with this group of companies in 1912, having graduated from Missouri University. I took a five-year

—2,427—

course there, and obtained the degree of Electrical Engineer.

My first work with the company was in construction work, in which I was engaged for about a year and a half. Following that, I then was placed on some cost analysis work

to determine unit costs of various types of construction, including the job which we had just completed which at that time represented the receiving substation at the St. Louis end of the Keokuk transmission lines.

That cost analysis work went on for some months, and from there I went into a short bit of work on some rate schedule preparation.

During the next six months, I was engaged on various applications, among which was the development of some 5600
studies leading toward the use of gas-house-heating for the St. Louis County Gas Company.

My next operation was to handle sales engineering work for power sales. We call it the power sales division to distinguish it from the residential and smaller types of sales work.

In that work it was necessary in those days to do our own construction, on the customers' premises; in other words, to make him a proposal to change his motors or change over from steam or some other form of power, to electricity.

So I had a combination there of sales and construction 5601
work.

—2,428—

In about 1917 the company (meaning this group of companies) decided to expand their operations into the adjoining counties surrounding the City of St. Louis, and St. Louis County. I was placed in charge of the new district, and built the transmission lines out to those adjacent counties, and took over operations one at a time, as the additional counties were taken on.

5602

My title then was General Superintendent of Outlying Divisions. That work was continued for several years, until about 1925. During that period I was in complete charge of the operation and construction of those properties, which were handled as a seperate unit, not a part of the city group. During the developmental period it was difficult to do it any other way.

As we had then completely connected the various towns and counties to which I referred, I then moved back to the
5603 St. Louis district, having been located at Festus, Missouri, a town about 35 miles South of St. Louis, while that work was going on; and I was then referred to as Assistant to the Vice President, and retained that title until about 1931.

There was another assistant doing similar work, there were two of us. My work was mostly of a technical nature.

In 1931, the growth of the company had been rather rapid during the period leading up to 1929, and the engineering requirements for plant expansion and system expansion had become more or less predominant from my

—2,429—

5604 viewpoint, and I gradually shifted almost entirely into the engineering phase, and at that time my title was changed to Consulting Electrical Engineer—which it is today.

Q. You have been employed continuously by Union Electric Company of Missouri, and its subsidiaries, or its predecessor company, since 1912, have you? A. That is correct.

Q. And you have held no other position, other than with the Union Electric or its subsidiaries or predecessor company? A. That is right, I have had no other position. The

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title itself is a little misleading because I do put in all of
my time for the company, I have no outside consulting work.

Q. Are you personally familiar with the properties of
Union Electric Company of Missouri and its subsidiaries?
A. Yes, I am.

Q. And are you also personally familiar with the opera-
tions of those companies and the problems arising out of
the operations of those companies? A. Well, to the extent
that any one individual can say that he is familar with a
large company of that type, I think I can say so, yes. 5606

Q. Now in order that we can be clear as to the names

—2,430—

and relative relationships of the companies as to which you
are testifying, will you state the subsidiaries, the names of
the subsidiaries of the Union Electric Company of Missouri?
A. Union Electric Company of Missouri is an operating
company, and at the same time has subsidiaries. The sub-
sidiaries of the Union Electric Company of Missouri include
the following companies: Union Electric Company of
Illinois; Mississippi River Power Company; Iowa Union 5607
Electric Company; Cupples Station Light, Heat and Power
Company; St. Charles Electric Light and Power Company;
Lakeside Light & Power Company; Union Electric, Land
& Development Company; St. Louis and Belleville Electric
Railway Company; St. Louis and Alton Railway Company;
East St. Louis and Suburban Railway Company; East St.
Louis Railway Company.

These two latter companies are in the process of disso-
lution or sale. Of those companies mentioned, there are
six subsidiary electric companies. I repeat, to make this

5608 entirely clear, the six electric companies are: Union Electric Company of Illinois; Mississippi River Power Company; Iowa Union Electric Company; Cupples Station Light, Heat and Power Company; St. Charles Electric Light and Power Company; and Lakeside Light and Power Company.

In the material which follows we refer to the Union Electric Company of Missouri and these six electric companies (seven in all), as the Union Electric Group. The other companies mentioned previously will be referred to by

5609 individual names. —2,431—

In addition to the subsidiaries which I mentioned as directly under Union Electric Company of Missouri, there is another company, Union Colliery Company, a coal company. It is a subsidiary of Union Electric Company of Illinois. In addition to these companies, the St. Louis County Gas Company is a gas company doing business in St. Louis County, and is not owned by the Union Electric Company of Missouri, but by the North American Company.

Q. And the St. Louis County Gas Company is operated, is it, in general by the same management? A. It is, it is

5610 operated just as one of the other group, by the same personnel, and very closely related to the other properties, but is separately owned.

Q. Will you state whether the name of the parent company was changed to Union Electric Company of Missouri in 1937? A. In 1937 the name was changed to the Union Electric Company of Missouri, from Union Electric Light & Power Company. It is the same company, essentially, as the previous Union Electric Light & Power Company.

Mr. Hamilton: I ask that this document be marked as Respondents' Exhibit No. 51 for identification.

The Examiner: It may be so marked.

—2,432—

(The document referred to was marked "Respondents' Exhibit No. 51 for identification".)

By Mr. Hamilton:

Q. Mr. Stokes, will you state what this exhibit represents? A. This exhibit represents the system of the Union 5612
Electric Group.

Q. Is the information shown confined to Electric facilities? A. It is. The system as shown on here includes an area——

Q. (Interposing) Before you specify as to that, I simply want it identified.

Will you state whether the exhibit has been prepared under your supervision? A. It has.

Q. And the facts shown as to the electric facilities of the respective companies have been taken, have they not,
from the records of the respective companies? A. They have. 5613

Mr. Hamilton: I offer it in evidence as Respondents' Exhibit No. 51.

Mr. Buswell: No objection.

The Examiner: It is admitted in evidence under the number assigned it.

—2,433—

(Respondents' Exhibit No. 51 was received in evidence.)

By Mr. Hamilton:

Q. Now I note from the map, Exhibit 51, that no electric service is indicated for the Mississippi River Power Company. Is it correct that that company has no distribution facilities? A. That company has a certain number of large industrial customers located mostly right at or near the dam, but——

Q. (Interposing) By the "dam", do you mean Keokuk?
5615 A. The Keokuk Dam and power plant, in that immediate vicinity.

But the general service in that community, distribution to the public at large, is handled by the Iowa Union Electric Company.

Q. And is it true that such customers as take service from the Mississippi River Power Company take service at primary voltages from the transmission lines? A. They do, they take service from the Power Company at primary voltage of somewhat higher than the ordinary distribution voltage, it may be 11,000 volts to 13,000 volts, and up.

5616 Q. Now will you state very briefly what facts are shown in the exhibit? A. This exhibit portrays the system of the Union Electric Group which extends from Burlington, Iowa,

—2,434—

on the north, southward along the Mississippi River to St. Louis, and further south to Fredericktown, a distance of approximately 220 miles.

It also extends from East to West, about 150 miles. On the West it terminates at the power plant and dam of the Osage Hydroelectric Plant. At that location there is shown a small hatched area, which represents the service area of

the Lakeside Light & Power Company, a small company which supplies some local service for the benefit of that particular district.

On the east, it extends to and including certain areas in Illinois adjacent to St. Louis, including the City of East St. Louis.

The transmission lines interconnecting these areas are shown on the map. The cross-hatched portion indicates that the service there is dense, and it would be impracticable to show all of the lines in that area. 5618

Q. Now will you state at what voltages transmission lines appearing on this map are shown? A. The lines there represent merely high voltage main circuits. For example, the line from Keokuk down to St. Louis is a 110,000 volt line, and the lines shown out to the Osage plant from St. Louis are 138,000 volts.

Q. Are all lines shown above a specific voltage? A. There are no small distribution lines shown on this map, the lowest

—2,435—

voltage at which any is shown is 33,000 volts, and your statement is correct. 5619

Q. Now in order to interpret very briefly the legend, I note at Keokuk the letters "C-H". Will you state the meaning of that legend? A. Well, "C" as shown in the legend, represents the Mississippi River Power Company, and "H" stands for hydro, or hydro-electric. So a rectangle marked "C-H" means a hydro-electric plant owned by the Mississippi River Power Company.

Similarly, letter "A" stands for Union Electric Company of Missouri, and its subsidiaries, or the Union Electric Group.

"B" stands for Union Electric Company of Illinois.

"D" stands for other subsidiaries of the group.

"S", similarly, stands for steam, corresponding to "H" for hydro.

So, for example, a plant marked "B-S" would be a plant owned by Union Electric Company of Illinois, and a steam plant.

Q. All right. Now just one further explanation, if you will. A number of figures appear on the map, such as "D-10",
5621 appearing in Lee County, Iowa. Will you state the significance of that particular legend? A. In the legend, number 10 refers to a company marked Denmark Light & Telephone Company, this being one of a number of companies, a number of utilities, which buy service from the Union Electric

—2,436—

Group. And "D" means that it is sold by one of the subsidiaries.

Q. Of Union Electric Company of Missouri? A. Yes. There are others in a similar situation who buy power from the group. They will be described later.

5622 Q. Now will you state the aggregate square mileage of the territory served by the Union Electric Company Group? A. The Union Electric Company Group serves a total of about 3100 square miles in actual coverage, with their own distribution system. This does not include areas in which their power flows due to sale to other utilities.

Q. And the population, if you will, of that 3100 square miles? A. Well, the population of that area is—well, as nearly as I can estimate it—there is no exact designation such as Census figures, for the 3100-mile area—but as near

as I can estimate it, it is about 1 million and a half population.

Exact figures, for example, in the 1940 Census, would give St. Louis 813,748 population, and we have the population figures for other more or less important towns and communities in the area.

Q. Now in addition to the City of St. Louis, how many counties are served by the group with electric service? A. This group serves all or part of 15 counties in three States. 5624

—2,437—

Q. May I ask, before you enumerate the counties, whether the City of St. Louis proper is located in any particular county, or whether it is a separate entity? A. The City of St. Louis is a separate entity. It is peculiar in that it is a county itself, it is its own county. St. Louis County, which surrounds the City of St. Louis, does not include the City itself.

Q. Now in order to clarify the exhibit, Exhibit No. 51, will you very briefly state the counties in which electric service is furnished by the Group? A. The counties in which 5625
the Group furnishes electric service are: In Missouri,—Camden, Miller, Morgan, St. Louis (referring to St. Louis County); Franklin, Jefferson, St. Charles, St. Francois, Madison, Washington—and in those last two counties the service is only partial.

In Illinois,—Madison County, St. Clair, Hancock, Henderson.

In Iowa,—Lee County.

Q. I think you gave Madison County twice. A. I did. There is a Madison County in Missouri, and a Madison

County in Illinois. We only have a very small amount of service in Madison County in Missouri.

Q. Now in this distribution territory, how many communities are served by the group? A. Well, they serve

—2,438—

directly 114 cities, towns, villages and unincorporated communities. These range from small communities to pretty large cities.

For example, I could summarize the relative size of these
5627 communities as being 22 communities of less than 250 population; between 250 and 1,000 population—47; between 1,000 and 5,000—30; between 5,000 and 10,000—6; between 10,000 and 25,000—5; and from 25,000 to 50,000 population—2; from 50,000 to 100,000—1; and over 100,000 population—1. That totals 114.

Q. And will you state very briefly the names and give the population, if you are able to, of the more important communities included in that list? A. Well, first and foremost, of course, is the City of St. Louis itself, which I previously mentioned as having a population of 813,748.

5628 Where these population figures are stated, we are using the 1940 Census when available, and where it is not available, it refers to the previous Census, 1930.

In St. Louis County, we can mention Clayton, with a population of 13,872.

Mr. Buswell: Will you state whether that is the 1940 Census figure or the 1930 Census figure?

The Witness: All right. That particular figure is a 1940 Census figure.

—2,439—

By Mr. Hamilton:

Q. Follow that procedure, if you will? A. Kirkwood, the 1940 Census is 12,087; Maplewood, 1940, 12,833; Brentwood, 1940, 4,334; Ladue, 3,976, 1940 Census.

Others in there could be mentioned, such as Berkeley, 2,577.

Now I will go a little further. In University City, which is a suburb of the City of St. Louis, and also located in St. Louis County, we have a town of 32,863, 1940 Census 5630
figure.

Webster Groves, also in the same county—18,328, 1940 Census. There are other towns, such as Wellston and Normandy, which run from 2,500 to 7,400. That illustrates the type of cities found in St. Louis County.

In Franklin County I can mention four, being all of the important towns in that county. They are: Pacific—1,666 (all four of these being 1940 Census figures); Saint Clair—1,410; Union—2,099; Washington—6,635.

May I explain that those other towns previously mentioned as Normandy and Wellston, where I did not give the 5631
exact figures, those were from the 1930 Census, but all of the larger ones I mentioned were from the 1940 Census.

Now in Jefferson County, we have Crystal City—3,416, 1940; De Soto—5,117, 1940; Festus—4,612, 1940. There are other towns there smaller, and we have not the 1940 figures

available.

St. Charles County has only one town of any size. That is St. Charles itself, with 10,807 population, 1940 figures.

St. Francois County, which lies to the South: Bonne Terre, 3,740, 1940; Flat River—5,403, 1940; and Elvins—2,403, 1930 Census. Elvins is mentioned because it is a rather important mining town down there.

Q. What kind of mining? A. Lead mining, what they call a variegated lead district.

Now in Illinois, Saint Clair County, it contains East Saint Louis, with a population of 75,469, 1940 figures; Washington Park—3,837, 1930 Census—and others not
5633 large enough to mention.

Madison County contains Alton—30,151, 1930 Census—later figures not yet available; Roxana, a small community of 1,139, 1930 Census, but mentioned because it contains some very large industrial concerns, such as the Shell Oil Corporation Refinery, and others.

Hancock County: Dallas City, Hamilton and Warsaw, are three communities running slightly under 2,000 population, 1930 Census.

In Iowa, Fort Madison is located in Lee County, and has a 1940 population of 14,049; and Keokuk, with a 1940 population
5634 lation of 15,015.

—2,441—

Q. Now all these cities which you have specifically referred to are served with electric service by the Union Electric Group, is that correct? A. They are, all that I mentioned, and many others that I did not mention.

Q. Now will you state the total number of electric customers of the Group, and indicate, if you will, the general classification in which they fall? A. The Union Electric Group had, as of May 31, 1940, 351,565 customers of all

classes. To segregate these into classes, we divide them into, first, residential—309,698. All these figures, now, are as of the same date. This residential group are being again subdivided into two divisions: first, urban and suburban group —294,998; rural—14,700. Those two figures make up the 309,698 residential customers.

Then the small light and power classification—41,377.

Large light and power—412.

Public street and highway lighting—51.

Other public authorities—8. 5636

Other utilities—15.

Municipal distribution systems—3.

Electric railways—1.

That total equals the original total of 351,565.

Q. Are you able to classify that aggregate figure which

—2,442—

you have given by geographic districts within the territory? A. In St. Louis and vicinity there are 339,825 customers; in Keokuk and vicinity—11,403; in Lakeside and vicinity—337.

Q. Lakeside and vicinity being the territory shown on 5637
Exhibit No. 51 as the hatched territory around Osage? A. Yes, it is out here to the left. That is simply a service rendered to a little local community surrounding the Osage Dam.

The Examiner: Those two lines that lead from Osage, are they of 138,000 volts each?

The Witness: Yes, those are two routes. On each of those routes there are two circuits. On the northern route there are two independent single-circuit lines, and on the southern route there is a double-cir-

cuit steel tower line. Yes, those are 138,000 volt transmission lines from the hydro plant to St. Louis, going, one of them, by way of Rivermines. That is explained by the fact that we have a load there of around 30,000 kilowatts from the St. Joseph Lead Company, and some condensers are located there for voltage control. Then we supply service to our own district at that point.

5639 *By Mr. Hamilton*:

Q. Now in addition to the electric service, at the cross-hatched area shown on Exhibit 51, does the company make

—2,443—

sales of electric energy to other purchasers in the general territory? A. Yes, they do. They sell to 15 neighboring utilities, and three municipal distribution systems.

Q. Now those sales are by the Group, are they? A. Information is available with respect to each company.

Q. Will you give that information? A. By reference to the exhibit, we have the Iowa Southern Utilities Company—

5640 that is No. 14 in the legend—and its point of delivery of service is at Burlington, Iowa, shown on the map at the extreme northern extremity, and marked "C-14". Is that clear?

Q. Yes, go ahead. At that point we sell to that company 22,790,600 k. w. h., or rather, sold to that company that amount in 1939, which is used in Burlington, and the surrounding territory.

Mr. Buswell: You say "we sell"?

The Witness: Union Electric Group sells.

The next company is the Wever Electric Company, and it is No. 13 on the exhibit, and makes its sale at the point marked "C-13".

By Mr. Hamilton:

Q. That indicates the sale by Mississippi River Power Company? A. Yes, they purchased only 75,080 kilowatt

—2,444—

hours in 1939.

Q. The delivery, however, was by the Mississippi River 5642
Power Company? A. The delivery in that case is by the Mississippi River Power Company.

Q. As indicated by the symbol "C"? A. By the letter "C".

The next company to be mentioned is the Denmark Light & Telephone Company. They are shown as No. 10, and delivery is made at "D-10", which is on a line there right near the name "Fort Madison". There is a little arrow that points down to it. They took 243,227 kilowatt hours in 1939.

Iowa Electric Company, No 11, purchased 2,886,990 kilo- 5643
watt hours in 1939, and it was delivered to them at the point marked "C-11", which is a delivery from the Mississippi River Power Company.

The town of West Point is a small village lying west of Fort Madison, and it purchased service for their municipal distribution system which comes out of a sub-station in Fort Madison. That was 291,570 k. w. h. in 1939.

Then Van Buren Light & Power Company, No. 8, purchased 1,022,320 k. w. h. in 1939, and can be readily seen

there as "C-8", on the exhibit, showing point of delivery. That service provides electric facilities to a large part of Lee County in the part which we do not directly serve.

—2,445—

Illinois-Iowa Power Company at Hamilton and Dallas City—that is No. 4—provides service to a territory north and east of Keokuk, toward Galesburg, Illinois, and purchased 41,748,740 k. w. h. in 1939.

Central Illinois Public Service Company, at Keokuk,
5645 Hull, Quincy and Meppen, provides service to a large area in West Central Illinois, and they purchased, as shown on the exhibit, marked No. 6 in the legend, 51,422,070 k. w. h. in 1939.

A small company known as Appanoose Light & Power Company purchased 5,560 k. w. h. in 1939. They are marked No. 12 on the exhibit, and are shown as "D-12", which indicates that they were supplied from other subsidiaries. As a matter of fact, they are supplied from the Iowa Union Electric Company.

Montebello Electric Company took 35,280 k. w. h. in 1939,
5646 and are marked No. 7 on the exhibit. They provide service to a territory in Hancock County, which is not very heavily settled, and in which we ourselves do not have the distribution.

Missouri Power & Light Company are supplied service at Keokuk and Ilasco, and provides service to a large area in Northeast Missouri.

Q. Will you state the point of delivery? A. The point of delivery is at Hull for this Ilasco delivery, and at Keokuk —no, this particular one, the Missouri Power & Light Com-

 5647

pany, the major part of that delivery is at Keokuk, and the

—2,446—

service is used in Northeast Missouri. The amount was 7,168,500 k. w. h. in 1939.

Now that point of delivery is about 10 miles—No. 5—out from Keokuk.

Illinois-Iowa Power Company at Cahokia, and Venice—now I have moved down to this bigger area—provides service to a large area in South Central Illinois. The service taken in 1939 amounted to 252,676,900 k. w. h. 5648

Q. Now is that figure, Mr. Stokes, exclusive of the figure which you have previously given for delivery to Illinois-Iowa Power Company? A. It is. The previous figure was for delivery at Hamilton and Dallas City, which is up near Keokuk, whereas this delivery is near St. Louis. This is indicated by the same number—4—and is shown as "B-4", right to the right of the main part of the City of St. Louis. The word "Venice" is shown on the map, and just above it are the letters "B-4", indicating the delivery to the Illinois-Iowa Power Company at that point. That is a large delivery.

East Missouri Power Company took 498,175 k. w. h. in 5649
1939, indicated by No. 18—a small sale.

Missouri Electric Power Company took 4,092,990 k. w. h. in 1939. That is indicated by No. 17, on the exhibit.

Arkansas-Missouri Power Corporation took 5,373,036 k. w. h. in 1939. That is No. 16. That point of delivery is right, not far from St. Louis. That is "A-16", sold by the

—2,447—

Union Electric Company of Missouri. It is almost down to Madison County.

The City of Farmington, which is in that same district near this last point of delivery, took 2,496,600 k. w. h. in 1939. It is marked as No. 2, and shown just south of Rivermines, as "A-2". It was sold by the Union Electric Company of Missouri.

Western Light & Telephone Company took 587,400 k. w. h. in 1939, and that is shown as No. 15 on the map. That is a small concern that buys a little power from Lakeside, near the Lakeside area. You will find it out at the extreme west
5651 of the map. They provided service adjacent to that served by the Union Electric Group.

Q. And that point of delivery is shown on the map as "D-15", is it not? A. That is right. It comes off of the little red square indicating the hydro plant there in the middle of the Lakeside Light & Power Company hatched area.

That completes the list of electric companies and municipalities buying service.

This area which the company serves is a relatively high load density area, taken as a whole.

Q. Mr. Stokes, I think you may not have mentioned the
5652 deliveries to the City of Kirkwood appearing on Exhibit No. 51 as No. 1. Will you locate that point of delivery and give

—2,448—

the sales? A. It is immediately west of St. Louis, and is marked "A-1". The City of Kirkwood took 7,573,400 k. w. h. in 1939. It is a suburb of St. Louis, located a few miles west.

Also, Nauvoo Electric Light & Power Company, shown as No. 9 on the exhibit——

Q. (Interposing) Is that point of delivery near Keokuk? A. Yes, it is. I am looking for the k. w. h. It is

between Keokuk and Fort Madison, marked "C-9", and is a very small concern served by the Mississippi River Power Company at the point indicated. Nauvoo Electric Light & Power Company took 331,850 k. w. h. in 1939.

Q. I interrupted your comment on the load density in the area served. Had you finished your statement in that regard? A. Well, I could expand that thought a little bit. The Union Electric Group would, in my opinion, be regarded as what could properly be described as a metropolitan electric company, because the majority of its property is in or adjacent to a large city. In 1939, the Union 5654
Electric Group produced a total of 2,579,520,155 k. w. h., of which 401,412,412 k. w. h. were sold to other utilities for resale, leaving 2,178,107,74? as the production for its own customers in an area with a total estimated population of about a million and a half persons.

—2,449—

Q. Now those figures you have given on output are group figures, are they? A. Group figures for the Union Electric Group.

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Q. And when you have spoken of generation, have you spoken of net output; in other words, your figure of two billion plus, which you last gave, is a net output figure? A. That is probably a gross output figure, that is, our records on the whole are the output from the main generating unit, and I would call that figure a gross output figure.

To illustrate the comparison with the general public use in the United States, which comparison may not be of any particular moment, but for such as it is worth, the report of the Federal Power Commission indicated 128,037,-

000,000 k. w. h. for 1939, with a total population of 131,000,000, approximately. With these figures we conclude that the Union Electric Group produced about 1.7 per cent. of the electric production in the United States, and supplied it, supplied that service to about 1.15 per cent. of the population, indicating that we were somewhat above the average density of the country as a whole.

Q. Now is the greater portion of the electric load concentrated in and about the City of St. Louis? A. It is,
5657 yes. The majority of all of the load is sold in St. Louis and vicinity. The area which I would consider as the vicinity

—2,450—

of St. Louis has been referred to as the metropolitan district. This area, which was established by the United States Census Bureau, comprises 821½ square miles, and includes the City of St. Louis, and a major portion of its surburban territory. It is the center of a more extensive trade territory or region, which includes districts having a general radius of about 40 miles from St. Louis. These references are used by the Chamber of Commerce and others when
5658 describing the trade territory.

St. Louis City has actually lost a little population within the city limits during the past decade. The flow of population has been from the city to St. Louis County. Its population in 1930, in the 1930 Census, was 821,960, and it is now 813,748. But whereas the City has been losing, St. Louis County has gained, and has increased its population in the last 10 years by 61,114. Its present population is 272,707, compared with 211,593 ten years ago, an increase of 28.9 per cent.

St. Louis has not extended its city limits in all these many years, as a good many cities have.

St. Louis and St. Louis County, both combined, account for a population of 1,086,455. If you took both together, it would indicate a 5.1 per cent. growth in the last ten years.

It, in general, is pretty well suited for industrial operations. The valley is well placed for railroad connections,

—2,451—

and the river furnishes water supply, and out of the district's population from the 1930 Census of 1,335,158 persons, 5660
I would take that to be a rather general figure, it is assumed that 154,000 were employed as wage earners in the factories. Those figures were obtained from the 1930 Census, but the exact area to which they apply is not completely, fully designated.

We have estimated 162,555 gainfully employed workers in manufacturing and mechanical industries; 85,383 in trades—that means having divided the general industry as a whole into about 10 classifications, those are the two largest ones for the St. Louis district. Others are very much less important. 5661

Q. Now is there any one industry that predominates in the St. Louis industrial area? A. Well, St. Louis is a leader in the shoe manufacturing business and in the printing business—those are the two rather large industries. We don't forget that we make lots of beer, but I should say that the shoe business and the printing industry probably represent the major businesses. We are somewhat of a railroad center. Shall I describe the railroad or transportation facilities at this point, or shall I let them go?

Q. Well, before your leave this general question of the concentration of industry in St. Louis, are you able to state any statistics as to the representation of industry in the St.

—2,452—

Louis area? A. Yes, I could give a few illustrative examples.

Before leaving the population figures entirely, I would like to mention the persons per quare mile in the metropolitan district previously referred to, as 1,544, and in the City of St. Louis, as 13,333. That is not an extremely high
5663 density.

Now with respect to the industries, St. Louis has a diversified business, it doesn't manufacture just one thing like automobiles, its load characteristics are rather typical of the nation as a whole, and if you were to divide the industrial activities of the nation into 18 divisions, which has been done in some studies, we would find a number of them represented in every one of those.

As an example, if we took one division as food and kindred products, we would find the Union Biscuit Company as representative of bread and other products; the Standard
5664 Tilton Mill Company, a large flour mill company, representing the grain products.

In textiles, the Ely-Walker Drygoods Company is a typical representative. It is a very large manufacturer of men's shirts and kindred products.

In forest products, we have a number of box companies, and a casket company represented by the St. Louis Casket Company; and the National Chair Company makes chairs. The Loy-Lange Box Company is a large maker of boxes.

—2,453—

Paper and allied products is quite an industry in St. Louis, represented by two large concerns, the Graham Paper Company, and the Orchard Paper Company.

Printing and bookbinding, and lithographing has the *Woodward-Tiernan Printing Company*, among others.

Chemicals and allied products, carbide: Midwest Carbide Corporation. That is not at St. Louis, that is at Keokuk, but I mention it here because it is one of our large customers.

5666

The National Lead Company and the Monsanto Chemical Company are good examples.

In the oil or petroleum refining business, we have the Shell Oil Company, which is one of our large customers, located at Wood River, a few miles north of St. Louis.

The rubber goods—there is a boot and shoe manufacturer, the Cupples Company, making some tires and rubber goods, and they are also a customer of ours.

And so on. We have Keokuk Steel Casting Company. That is one of the largest industrials, which was referred to
a while ago as being direct customers of the Mississippi River 5667
Power Company. It is an electric furnace production.

In connection with the Carbide, they also manufacture 50 per cent. ferro-silicate which is used in a number of applications, it is used for making some kinds of bearings.

Aircraft and transportation—we have the Curtiss-Wright Corporation, manufacturing aircraft. They are undergoing

—2,454—

a very large expansion at this moment, to increase the capacity of their plant by a very large amount, and they

5668 *Stanley Stokes—By Respondents—Direct*

are adding what is estimated to be from 8,000 to 10,000 employees.

American Smelting and Refining is a good example of a non-ferrous metal. That is a big smelter, really connected with the St. Joe Lead Company.

We have glass business on a large scale. At Alton, Illinois, we have the Owens-Illinois Glass Company, which makes bottles and glass bricks. At Crystal City, Missouri, 35 miles south of St. Louis, we have one of the main fac-
5669 tories of the Pittsburgh Plate Glass Company.

There are, in addition to those industries, which are widely diversified, some heavy industries, among which I will classify the glass companies and the St. Joe Lead Company, the largest lead company in America, which operate a smelter at Herculaneum, which is just south of St. Louis, where we have extensive service. They also have the large mines in St. Francois County, which is indicated by the word "Rivermines" on Exhibit No. 51, as being about the center of the mining district.

5670 We have building materials, packing companies, Armour Packing, and others.

So that St. Louis did not have as radical a change in load during the depression as some of the other cities where the industry was not so diversified.

Q. Now are there natural resources in the territory which have contributed to the industrial development of the territory? A. Yes, I suppose all territories are controlled by their natural resources in the long run. The St. Louis region has certain topography characteristics which make it what

it is. The region as a whole is valleys and uplands, it is the broad river valleys of the Mississippi, Meramec and Missouri Rivers. They flow over deep beds of alluvium, and constitute extensive flood plains which are limited by abrupt bluffs as you get to the edge of the river valleys. There is another small river there known as Big River, which meanders over a considerable part of the country and is otherwise similar to the Missouri.

The characteristic feature of the general landscape is the level of the uplands, which were a part of the Great Plains 5672 originally. The general elevations are about 800 feet on the bluffs up north of St. Louis, around Alton, and from 7 to 9 hundred feet will probably catch the highest elevations, and around 500 and thereabouts the lowest.

There are very little unbroken areas, I mean there are very little areas that are broken so that railroads can't conveniently utilize the area. They can follow the valleys of these big rivers continuously, and I will illustrate a little later the extent to which the railroads have utilized this area.

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It is also very suitable not only for railroads, but for 5673 terminal facilities, and large industrial plants. The water supply is favorable.

As you go west and northwest of the city, you get into a rolling farm country with some rugged area, as you approach the Missouri River bluffs, which are off to the west and north. As you go south and southwest, you get into the Ozarks, which are just rough and rugged little mountains, but they don't go much above 1,500 feet maximum height.

The prairie lands, of course, are used for agricultural purposes, just like the rest of the Mississippi Valley. The

5674 underlying geologic structure is sedimentary and rests on what is known as Archean Granite. The upper part was deposited by the rivers, and a gradual influx of the top soil has produced some very fertile valleys, washed in there by the action of the streams.

The loess, which covers the upland to a depth of from a few feet to 50 feet, is used in the manufacture of brick. It is very good for fire clay as well as common brick.

We have a lot of gravel formation used for the gravel in-
5675 dustry extensively. It is particularly good concrete gravel in that area. The Mississippi gravel is not quite as good as the Meramec. Then we have the coal strata, which extends primarily out through the Illinois region, and that is well

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known.

We have the coal layer, and then the shales and the clays, all of which are used extensively for terra cotta, sewer pipe, paving brick, tile, and some of those shales in limestone are used in the manufacture of cement. We have two large cement industries immediately in the St. Louis
5676 area, and another very large one up between there and Keokuk.

Oil has been discovered in Illinois, the location, generally speaking, being about 60 miles east of St. Louis, and a little bit south. There has been no oil of consequence discovered right close to St. Louis, although at the little town of Dupo, 10 or 15 miles south, on the Illinois side, they pumped some shallow fields there for a number of years.

Q. You have spoken of deposits of lead; where are those found? A. They are found mostly in St. Francois County,

with Rivermines as the center, as shown on this exhibit. I believe that I am correct if I say that the St. Joseph Lead Company is the largest lead mining company in the world. I am sure it is the largest in this country, and it has very extensive mines down there covering a large area. As I recall it, there are 12 or 15 miles of underground electric railway haulage where they carry the ore underneath the ground, and bring it to a central shaft for elevating it to the surface. They have a number of concentrating plants, crushers, located at all of those different towns, such as 5678

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Bonne Terre, Elvins, Flat River, Leadwood, and others. The St. Joseph Lead Company is a very large user of power.

To give an approximate idea of their use, without disclosing any figures that would be personal to them, I can say that their peak load runs in the neighborhood of 26 to 30 thousand kilowatts, and when the lead business was good, as it has been in the past, and which it is now again becoming in the last three months, they run continuously. That represents a lot of money in one month.

Q. Now without going into great detail, will you indicate the transportation facilities available in the territory? A. As I said, with regard to the topography, the railroad facilities were good from the standpoint of construction of railroads, because of the way that the valleys and rivers ran, and in the early days, the railroads began to build in there. At the present time, St. Louis is served by 19 trunkline railroads, 3 short-line railroads, and 5 railroads engaged exclusively in switching. The aggregate main track mileage operated by these trunklines is 95,200 miles, or 34.48 per 5679

cent. of the total miles of track operated by Class 1 Railroads in the country. That total miles, by the way, is 275,506.

The trunklines, most of which terminate in St. Louis,

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I believe all of them,—and I don't mean that they just go through there, but that in most cases is the terminus of their line—are the: Alton Railroad; the Baltimore & Ohio Railroad Company; Chicago & Eastern Illinois Railway Com-
5681 pany; Chicago & Northwestern Railway Company; Chicago, Burlington & Quincy Railroad Company; the Chicago, Rock Island & Pacific Railway Company; Cleveland, Cincinnati, Chicago & St. Louis Railway Company—that is usually known as the "Big Four"; Illinois Central Railroad Company; Illinois Terminal Railroad System; Louisville & Nashville Railroad Company; Missouri, Kansas and Texas Railroad Company; Mobile & Ohio Railroad Company; New York, Chicago & St. Louis Railroad Company; the Pennsylvania Railroad Company; the St. Louis, San Francisco Railway Company; St. Louis, Southwestern Railway Company;
5682 Southern Railway Company; Wabash Railway Company.

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In addition to those trunk lines there are short lines: Litchfield and Madison Railway Company; St. Louis and O'Fallon Railway Company; and St. Louis and Ohio River Railroad Company.

Then the switching companies are: Alton and Southern Railway Company; East St. Louis Junction Railroad Company; Manufacturers Railway Company; Missouri-Illinois Bridge and Belt Company; Terminal Railroad Association of St. Louis.

All those lines are available to St. Louis and switch in the yards there. As a matter of interest, we recently had a fire in the terminal control station which controlled all of those trains coming in and out of that yard, and it burned up all the signal systems, and it became quite a major problem to keep the yard operating. They adopted some very interesting expedients with loud speakers at every switch throughout the yard, had men stationed there, and a man at some central point to give his orders, and the switching men would
hear them over these loud speakers and operate the switch. 5684
Although they had a disturbance for six or eight hours, ten or twelve hours later they had the service going with fairly good results. They are building a new terminal switching station there now.

In addition to the railroads I should have river transportation. St. Louis is situated on the Mississippi River, Inland Waterway System, and that consists of a series of navigable rivers and canals having a total mileage of 13,394 miles, and connecting by water 29 of the principal industrial centers of 20 states in the Mississippi River Valley.

There has been considerable activity in the river transportation recently, and completion in 1932 of dams and locks on the Illinois and Des Plaines Rivers, and the Illinois Waterway Canal provides a 9-foot channel connecting St. Louis to Chicago and the Great Lakes system of waterways.

The latest project on this Inland Waterways System is the construction of 26 dams and locks on the Mississippi River between St. Louis and Minneapolis.
They were completed in 1940 to provide a 9-foot navigable channel between those cities. I recall that the estimate on

about 24 of those dams was $132,000,000-odd, and it has been materially increased since then.

We have four airlines available to St. Louis.

I would like to mention one other item of interest in connection with transportation, which indicates the extent to which bus line transportation has developed.

A total of 367 truck lines, operating out of St. Louis, provide store-to-door delivery to 18,114 towns and villages within 44 surrounding States and Canada. They serve 1,440
5687 towns in Missouri, 1,692 towns in Illinois. Also the transcontinental and interstate bus lines, embracing 15 systems, serve St. Louis.

There is a great deal of our material these days being delivered from the point of origin to the point of receipt by bus lines. They take it clear to the final customer.

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Q. There are a number of State and national highways that go through the city? A. There are. We are on five national highways, numbers 40, 50, 61, 66 and 67, as well
5688 as some of the main State roads. 66 is the chief highway through St. Louis.

Mr. Hamilton: I ask that this group of four sheets be marked for identification as Respondents' Exhibit 52-A, 52-B, 52-C and 52-D.

The Examiner: All right, they may be so marked for identification.

(The sheets referred to were marked as "Respondents' Exhibits 52-A, 52-B, 52-C and 52-D, for identification".)

By Mr. Hamilton:

Q. Mr. Stokes, will you explain what Respondents' Exhibit 52 for identification represents? A. Exhibit 52 consists of three maps and an explanatory sheet indicating symbols which apply to one of the maps. These three maps together represent the same territory as shown on Original Exhibit 51 but on a larger scale. The exhibit marked "52-A" represents the area at Lakeside.

Q. That is, sheet "A" of the exhibit? A. Yes. It is an expanded view of the little hatched area near the Bagnell Dam, and referred to as the Lakeside Light & Power Company district. It simply shows the lines of the little Lake- 5690

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side Company. They are in heavy black lines leading to the south, and branching around in among these hills.

Q. And the broken lines on the sheet represent county lines? A. Those are just county lines. I believe that is about all the description required. The heavy lines leading to St. Louis and to Rivermines shown on there represent the beginning of these major transmission lines which were shown on the other exhibit. 5691

The exhibit marked "52-B" represents the Keokuk territory on the first exhibit, 51, enlarged. It shows the town of Fort Madison, indicates Nauvoo, Wever, Montrose, Keokuk, Hamilton, and so forth, on a larger scale.

The dotted line up in the upper part is again a county line. And these heavy black lines—the one going south is the main transmission line to St. Louis, which is the same line as indicated on Exhibit 51. The other line leading to the left from Keokuk and marked at its terminal, "To Mis-

5692 souri Power & Light Company," is the line that supplies them with service at a point about 10 miles out, to which I referred in my previous testimony. I believe that sufficiently explains that exhibit.

Exhibit 52-C is a map of the St. Louis district showing the actual transmission lines, distribution circuits, substations and other features of interest which could not be shown on Exhibit 51 because of its size.

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5693 Sheet "D" of Exhibit 52 is a reference sheet to go with this large map, 52-C. As an example of its use, if you will look at the last word in the right-hand column, the word is "Winstanley". The symbol, or the letter is "Wi", and if you look directly east of the center of the City of St. Louis on this map, about an inch to the right of the river, you will see the symbol "Wi", indicating some transmission lines coming into it. That is what the Union Electric calls their Winstanley sub-station in East St. Louis.

Similarly, these other letters indicate various sub-stations, and usually by number or letter.

5694 Now, the distribution circuits on this map are shown down in the open area, for example in Jefferson County, you will observe the towns of Festus and Desoto, and radiating out from those towns are light lines indicating actual distribution circuits in that territory.

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That region is pretty rough down in there, and as you get down just above Hillsboro, there are very few habitations in there, which accounts for the open territory not covered by lines.

St. Louis County and the City of St. Louis, and East St. Louis, are so heavily covered with distribution circuits that they are just indicated here by hatched areas, like they were on the original map.

Q. Now have these maps, constituting Exhibit No. 52 for identification, and the accompanying identification chart, been prepared under your supervision? A. They have, they were prepared by men working immediately for me and under my direction, and I even assisted with the work.

Q. And the facts shown have been taken from the records 5696
of the companies constituting the Union Electric Group? A. They have.

Mr. Hamilton: I offer this exhibit in evidence as Respondents' Exhibit No. 52.

Miss Calkin: No objection.

The Examiner: Very well, the three maps marked respectively Exhibits 52-A, 52-B, and 52-C, and the succeeding sheet marked 52-D, are now received in evidence.

(Respondents' Exhibits Nos. 52-A, 52-B, 52-C, 5697
and 52-D, respectively, were received in evidence.)

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By Mr. Hamilton:

Q. Now referring to Exhibit No. 52, Mr. Stokes, and particularly to sheet C, are there set forth all distribution lines of the Union Electric Group in the area indicated? A. Well, as I explained in my last statement with regard to this map, the density of the distribution circuits in and around St. Louis is so great that they are still not shown there in detail.

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Q. But other than as indicated by the legend on the sheet C,—— A. (Interposing) They are shown in so far as possible. The feature of this map partly was to show the extent to which the distribution circuits cover these more lightly populated areas, as well as to show the main points of interest in and around the city.

The little round black dots in the City of St. Louis are distribution sub-stations, which will be described later.

The main power plants were shown on the other map and

5699 can be identified there.

Q. And all four sheets of the exhibit relate to electric facilities only? A. Electric facilities only.

The Examiner: We will recess until 2 o'clock.

(Whereupon, at 12:30 o'clock p. m., a recess was taken until 2 o'clock p. m., of the same day.)

5700

AFTERNOON SESSION

(The hearing was resumed at 2 o'clock p. m.)

The Examiner: The hearing will come to order.

Whereupon, STANLEY STOKES resumed the stand and testified further as follows:

Direct Examination by Mr. Hamilton (Continued):

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Q. Turning now to the physical properties of the Union Electric Group, Mr. Stokes, will you give us the general classifications of electric service property of the Union Electric Group? A. The investment in Union Electric Group of properties is roughly divided as follows: three-fourths of the property is in transmission lines, transmission substations, and power plant; and one-fourth in the distribution system. That is a little different than the ordinary division in a utility company. It is frequently spoken of that a utility company has one-third of its property in plant, one-third in sub-transmission, and transmission lines, and one-third in distribution. But in our particular case, due to the large percentage of hydro-electric investments, the effect of changing that ratio is shown, so that is easily explained. 5703

Q. Now, will you state the total name-plate rating of your generating capacity? A. The total name-plate rating of our

combined steam and hydro-electric plant is 722,500 kw. The nature of the property is very complex, and, as constituted, it represents properties which have been acquired by purchase, and structures which have been built, and equip-

ment which has been installed through the life of the present and predecessor company:

The present property is an accumulation of years of effort directed toward the acquisition, coordination and merging of scattered piecemeal power supply facilities, into the present unified power system, which makes it possible to supply adequate power throughout the entire area.

Before going into the detail of the steam generating plant, I would like to indicate the general nature of the facilities.

5705 In addition to the plants we have had to acquire pieces of land which were strategically located for both hydro-electric development and for steam plant development. Only a certain type of facilities like that are practical where you must have either water supply for condensing purposes, or you must have a suitable place to build a dam.

In addition to the plants you have to have all of the lines, transmission lines, sub-stations, warehouses, buildings, employees, and so on, warehouses for storage of materials, telephone facilities, and a great many other types of equipment that are utilized in such work. And in describing these

5706 —2,469—

I would like to divide them into several headings, of which power plants themselves would be one major subdivision. I think that is a convenient way, as convenient as any.

With regard to the actual name-plate ratings of the units to which reference was made, it is divided into 485,500 kilowatts of steam units, and 237,000 kilowatts of hydro units. Due to steam and water limitations, we de-rate those figures to what we call our dependable rating, and take 430,000 kilowatts as our steam plant rating, and 200,000 kilowatts,

which will later require some explanation, as the rating of the hydro plants, making a total of 630,000 kilowatts.

Now that, you will observe, is quite a reduction from the 722,500 figure given as name-plate rating. I believe that I might as well explain that 200,000 kilowatt hydro rating at this point.

The actual capacity of the hydro plants is divided into two plants, the Osage hydro-electric development, or Bagnell
Dam, as it is sometimes called, and the Mississippi River 5708
Power Company plant at Keokuk, which is located on the Mississippi River.

The two types of development are entirely different. The Keokuk plant has very little storage, and you have to take the river flow as it comes. You can fluctuate the level of the river in the forebay above the dam by maybe a foot or so, but the dam is relatively low in head, roughly 30 feet, and

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the requirements of river navigation are such on the Mississippi that you have to let the water through more or less
continuously. 5709

Furthermore, at times of high flood, you couldn't hold it anyway, you would have to take it through the wheels or let it go over the dam. So the Keokuk plant is what we would call primarily a stream-flow plant, and naturally its output varies with the river.

The maximum output, when water conditions are favorable, is 135,000 kilowatts. That is periodically reduced to possibly 70,000 kilowatts for a few days in the wintertime, due to freeze-up, what they call the early freeze-up. That is in the early stages of the winter, up the river, as the ice

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is forming, it cuts down the velocity of the water, and you have a temporary period there which rarely lasts over ten days, in which you couldn't count on an output of more than 70,000 kilowatts, although your kilowatt hours may be steady. In other words, we are not dealing here with a minimum quantity of water, but rather with a retarded type of flow, due to ice conditions.

In the summertime, in a dry year, the minimum condition approaches the same figure, due to low water. Now at
5711 the Osage plant, Bagnell Dam, we have a high-head plant there of about 100-foot effective head, and a storage reservoir containing a huge amount of water. The fact of the matter is that it is in the same general classification as Boulder

—2,471—

Dam, with regard to storage. It is not quite as large, but very close.

The shore line of the lake, for example, is about 1,300 miles, that is to say, considerably farther than from St. Louis to New York City, if you followed the shore line of the lake all around. So it is really a big storage reservoir.
5712 Now that one is to a large extent independent of stream flow, and is available at any time you want it, but if you use it, it will take time to recover it again. So that if we have normal water power conditions in the spring, we get roughly 130,000 kilowatts, with some degree of regularity, from the Osage project, and with 135,000 from Keokuk, or the Mississippi River project, we might have 265,000 kilawatts, which would be available almost constantly for three months

But you might say—why do we rate them at 200,000? Well, that rating is the firm capacity which we can guarantee

available over the entire winter peak season, just as though we had a bunch of steam plants sitting there to do the same thing. And it is what we refer to among ourselves as the cut-off capacity for winter peak.

That is to say, it is the amount of kilowatts that that hydro plant, utilizing its storage, can actually cut off from the top of our system, and as you can readily appreciate, the amount of peak that can be cut off in that manner is related

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to kilowatt hours, because the reservoir holds just a certain 5714
amount of storage, and if we want to run that through very rapidly, the actual peak capacity of our wheels is something like 160,000 kilowatts, but if we want to run that through at a rate which will supply all of the kilowatt hours over the winter peak period, which occur in the top 200,000 kilowatts of our load, then we have accomplished what we set out to do, and have cut the winter peak by 200,000 kilowatts.

I go into this lengthy explanation because the figures appear to be conflicting, and they really are not.

During the spring season we take advantage of the excess
water available for overhauling the big turbines, steam tur- 5715
bines. We take one of them down, like a 75,000 kilowatt unit, and overhaul it during the period of plentiful water supply. Then, during the summer, we run those turbines, take a dry year, for example, at their capacity and keep the reservoir as a reserve.

So at one time of the year the reservoir is operating as quick-starting reserve, it being started in less than 3 minutes,—sometimes we keep one of the wheels running all the time, and the gates throttled down and just letting enough water in there to keep the wheel up to speed, and if the fre-

quency of the system drops just a fraction of a cycle, there is a device that trips the wheel and it comes right back up to speed in the matter of a couple of minutes or less; in other words, sufficiently quick so that we would be able to hold

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the load against the loss of a big steam unit.

(Discussion off the record.)

By Mr. Hamilton:

5717 Q. Now you have named two of the generating units, two of the generating stations, in your system. Will you name the others? A. I have named the two hydro-electric plants. Now the steam plants are, first, the Ashley Street Station.

Q. You might locate these on the map. A. The Ashley Street Station is located in the City of St. Louis, as shown on Exhibit 51 by name, and it is marked. It is a Union Electric Company of Missouri plant.

Q. It is shown on the exhibit as "A-S", is it not? A. That is correct.

5718 Q. I think it is apparent from the exhibit, and you are referring to Exhibit No. 51, are you not? A. Yes. All the "S's" refer to steam, and the "H's" refer to hydro.

Now then, that plant is the first large steam plant that supplied the City of St. Louis. It is located on the Mississippi at the foot of Ashley Street in the City of St. Louis. At one time it supplied the entire load of the city. It has been repeatedly added to from time to time, and is very essential even to our present operations today.

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The chief necessity for it today lies not only in the generating equipment itself, which is both 25 and 60 cycle, but it serves as a steam heating plant, and it has a large amount of sub-station facilities, either in or adjacent to the building, which are very fundamental to the operation of the city's system. I will describe that in a little more detail later.

The plant itself acts further as a reserve for our general system operations. Its economy today is not sufficient to warrant its long-hour operation, but its reliability is very 5720
high, and in combination with the hydro system it serves a most useful purpose.

The present plant contains a generating capacity of 5,600 kilowatts in 25 cycle equipment; and 42,000 kilowatts in 60 cycle equipment, name-plate ratings.

The steam heating requirements which, in January 1940, were 625,000 pounds of steam per hour, maximum, during the winter peak, limit the electrical output of this plant at such time to 65,000 kilowatts, after the two boilers which are now under construction go into operation this winter. 5721
They are just ready to be tested out now. The capacity in the plant can be operated at either frequency, and to that extent it has the characteristic of a large frequency change. I should explain at this point that the Keokuk system is 25 cycle generation. At the time Keokuk was constructed, it was not possible to transmit power that distance, approxi-

mately 146 miles, at 60 cycles, and even today, with our present knowledge we would have to reduce our amount received by a very considerable amount if we had to take it at 60

cycles instead of 25 cycles, 25 cycles being much preferable for transmission.

Also at that time there were no 60 cycle rotaries available, and the majority of the load to be supplied from Keokuk was street railway load.

At the present time over 60 per cent. of all the kilowatt hours produced by the Keokuk plant at 25 cycles is actually consumed by the ultimate consumer at that frequency, either in railway load or heavy industrial load. Very little is used
5723 for lighting.

The part of that which is still being used for lighting is being replaced at the present time with 60 cycles, about which more will be said later.

The steam heating load being materially reduced in the summertime, down to about 100,000 pounds per hour, instead of 600,000 pounds, gives us available 500,000 pounds of steam per hour to be used for electric generation if we want to.

Q. You are now talking about the Ashley Street plant? A. Yes. The only digression on the Keokuk plant was made for the purpose of explaining this 25 cycle and 60 cycle gener-
5724 ation at Ashley Street.

Ashley Street having available, then, in the summertime,

—2,476—

500,000 pounds of additional steam, which can be used either through 60 or 25 cycle machinery, provides a very attractive reserve to the Osage hydro-electric plant, whose minimum output will occur in the summertime in a dry year. Those two fit in very nicely.

Ashley Street 25 cycle generation itself was put in, was included in the contract which was entered into about 1913 between the Mississippi River Power Company and the then

Union Electric Light & Power Company, for the service itself, a 99-year contract. And the Ashley Street plant was recognized as being a necessary reserve for the Keokuk. Otherwise, a reserve steam plant would have had to have been built, and that is still the case.

—2,477—

The annual load factor on the 25-cycle generation at Ashley Street is relatively low, but it is used in conjunction with the Keokuk generation to supply the load.

To continue with the thought that I was about to bring 5726
out a few minutes ago, namely that over 60 per cent. of the kilowatt hours were ultimately used at 25 cycles, that explains why, to a large measure, we have no particular interest in trying to change the frequency. The situation is static. The river is not producing any more power than it did in the beginning, we are not selling any more firm 25-cycle power, we are keeping the status quo and the customers, themselves, could not afford, nor would they care to, to spend any more money to change their equipment. Nobody would gain anything because the 25-cycle equipment, used for industrial power work and for street car work, is equal to or better than 5727
60 cycles. There is absolutely no advantage if you already own the equipment. If you had to buy it, 25-cycle equipment, in general, costs more than 60-cycle equipment.

Therefore, we have a growing 60-cycle load and a static 25-cycle load, and if anyone on the 25-cycle system wants to obtain additional excess or secondary power, we are delighted to sell it to him, but it isn't firm. On the other hand, if he wants firm power, we will generate that at St. Louis by steam, put it through frequency changers, and deliver it to him.

—2,478—

5728 Now that in itself is a simple operation for us because we merely reduce the amount of transmission that we otherwise supply; that is, we really generate our own load and do not send as much up under reserve conditions.

The result is that the various studies that have been made from time to time with regard to the possibilities and advantages of converting Keokuk to 60 cycles have always been proved the opposite. The best thing to do is to keep it as is and take all the growth at 60 cycles.

5729 Now, to again get back strictly to Ashley Street, you cannot discuss Ashley Street intelligently without relating it to this 25-cycle system. I am talking about the older part of the plant.

The use of this 25-cycle energy in St. Louis, aside from the street railway company, is in the Edison down-town district where it is used as direct circuit, and in the supply for that Edison system we get the source from both the 25 and the 60 cycle connections, and thereby obtain a degree of reliability that we could not obtain if all the supply were obtained from either system, the two systems not being electrically connected in any other way.

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Now in the 60-cycle equipment at Ashley Street, we have it connected by means of cables and transformers to our larger plant which I shall discuss. But it is essential that Ashley Street, although not by any means the largest plant on our system—and it is the oldest—it is essential that a

clear understanding of its position in St. Louis be had.

I may have to again refer to it later in the discussion on transmission because it is a focus of a number of plants

and is centrally located and serves so many different purposes; that is, although it is old I believe it probably is one of the most effective plants that we have because it, first, to summarize, supplies the steam heating requirements; it supplies the reserve for the Keokuk hydro plant; it acts as reserve for Cahokia plant, which will be described shortly, and supplies the service to the downtown Edison district,—half of it, the other half coming from the 60-cycle plants.

Now I shall describe the Cahokia steam plant next. That is located on this exhibit on the Illinois side of the river at 5732
St. Louis, and is named on the print——

Q. (Interposing) That is indicated by "B-S", is it ~~not,~~ indicating the Union Electric Company of Illinois? A. Yes. This plant is our largest plant and one of the largest in the United States.

The total installed capacity is 300,000 kilowatts in six turbo-generator units. There are 24 boilers outputting at 325 pounds pressure, and burning pulverized fuel. The plant, as recently constructed, had one of the first units as a 35,000-kilowatt unit. We found it possible to extend the boiler capacity and replace that unit with a 75,000-kw. unit 5733

—2,480—

in the same space, which materially increased the capacity of the plant, with moderate costs.

The unit which was removed was transferred to a plant which we call Venice No. 1, which will be described.

The Cahokia plant, which is located right on the river bank, on the east side of the river, transmits its power into St. Louis largely by means of underground 33-KV and 13,000-volt cables. It is also connected to the transmission system in the Illinois district by a number of 66,000-volt circuits and

two 50,000-kilowatt banks of transformers. More will be said about that under "sub-transmission system".

The plant is also connected to the Ashley Street station by a number of underground 33-KV submarine cables, they going submarine under the river and then underground the rest of the way to the Ashley Street station.

To summarize the figures, there are 28 of the 33,000-volt submarine cables laid in the river, and six 13,800-volt cables. I should have mentioned that they are also 33,000 volts, but
5735 they are operated temporarily at 13,800.

The plant is connected to the Illinois area by three 13,800-volt and three 33,000-volt and two 66,000-volt lines.

It is connected to the Page Avenue sub-station and to the Venice station, as is shown rather sketchily on this exhibit but the lines indicated there at Cahokia go north a short distance to the Venice plant, which is named and marked "B-S";

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thence, they go to the left to the sub-station marked "Page Avenue", shown with a "A" on it.

Now that transmission is from Cahokia to Venice by
5736 overhead double-circuit 66,000-volt lines, each circuit capable of handling 50,000 kilowatts.

From the Venice plant on to Page Avenue, by underground 66,000-volt submarine cables where they cross under the river and thence by underground cables to the Page Avenue sub-station.

The use of the 66,000-volt submarine cable was somewhat of a problem. The cable itself had been in use possibly five or six years, or a little longer, both at Cleveland and Chicago, but as far as I know this was the first application

of 66,000-volt submarine cables. Such cables are not essentially different from land cables, but have to be treated quite differently in the process of laying. They are reinforced with armor, over and above the lead sheeting, and that is protected by jute, and there are various coatings to protect them from erosion by the sands in the river, and from fish, and from anchors dragging, and various things that may happen.

But the primary difficulty is to lay the cable itself across the river with a boat which is in constant motion from the 5738
currents and getting it laid down so that it is not cracked, so that the lead is not cracked, and so that it lays properly to provide for shifting of the sands on the bottom of the river, so that if the sands were to be washed out underneath it, it wouldn't be left unsuspended through a long

—2,482—

unsupported span.

There are a number of things to be taken into account about which knowledge was not altogether available at the time. We have had more submarine cable experience than 5739
anyone else in the country, because altogether there are 38 or 39 of these cables now crossing the river from Cahokia at 33,000 volts, and we have had to pioneer that work at considerable difficulty, involving the loss of some of those cables which would not occur today with the knowledge we now have.

That is one of the things you have to learn and have to do with the matter of treatment of the bottom of the river, to keep it from shifting. But that was successfully overcome and those cables are working very satisfactorily

from Cahokia, and also are carrying the load successfully over the 66-KV route.

The determination of those 66-KV underground cables from submarine to land, offered a little problem which was successfully solved, and they are working all right.

Q. How did you solve the problem of shifting sands? A. We found it necessary to lay what is known as a mattress, the same type of protection that is used by river people up on the bank. We had to go down in the river and
5741 make up a woven mattress, either out of willow rushes or 1 x 3 oak planking, and you make up a mat like that and sink it by means of loading heavy rocks all over it, and, then, having got that weighted down in the river and loaded

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with rocks, you pin it there by driving piles through it, carrying them down to the point at which any navigation would not be bothered. That makes a firm footing; and as you approach the shore, the trouble is always that at the edge of the bank, down deep in the water it shifts. The
5742 middle of the channel doesn't shift so much. All we do in the middle of the channel is to see to it that the cable is laid with plenty of slack upstream so that any washing-out will permit it to settle in place without damage, and by making a firm footing, as you approach the bank, the last two or three hundred feet, we have eliminated the difficulty.

Q. How long are these cables under water? A. They are about 2,500 feet in general, and that was the source of our greatest single difficulty.

To begin with, we couldn't get a cable over about 1,300 feet in one length, and we attempted to join it in the river.

Making a 33,000-volt cable joint is somewhat of an undertaking even out on land, in a room where you can control the moisture content and where you can get this thing properly taped up, with hot oil kept pouring over it all the time, and then making a good lead seal. All of which takes from 24 to 36 hours, even under the most favorable conditions, on land.

Well, the only way we could do that was to do it on a boat,
and the boat kept rocking all the time due to the current
and the waves, and you just can't keep bending a lead cable 5744
continuously for 36 hours that way, and where the cable

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was suspended over the sides of the boat it showed, some years ago, that the lead had been damaged, and nobody knew any way to avoid that.

So we attempted to obtain a cable in one length, and
after considerable negotiation with the then Standard Underground
Cable Company—they are now General Cable—we
arranged to have a special reel built which could be handled
by our large cranes, made out of steel, and that was shipped
to the cable company and the cable company doubled the 5745
length of their building in consideration of our giving them
an agreed-upon set of orders for a certain number of years
for these cables, and they built us the cable in 2,500-foot
lengths, and so we laid it in one piece, starting right across
the river and finishing the job before we stopped.

The Cahokia plant is connected to the Ashley plant by a number, about five, of 33,000-volt tie cables. Those are heavier cables than the ordinary feeder cables, heavier in capacity and size of copper.

So that we now have the Cahokia plant and the Ashley Street plant properly connected, and we have briefly mentioned the transmission connections north to the Venice plant, which I shall now describe.

Before leaving the Cahokia plant I should say that this description which I gave was very meager from the standpoint of a plant of that character. Roughly, there is around

—2,485—

$32,000,000 invested in the plant, not including the substa-
5747 tions which are part of it, which would represent another five or six million. I mention that to indicate the size of the plant.

Incidentally, the plant is well supplied with land in a district in which such land is next to unobtainable; that is, there is only a limited amount of river footage available, and it is practically all being used for essential industries, some of which could not be acquired today even by condemnation because it is in the public interest for so many purposes, such as railroad yards and other facilities, that if a more or less farsighted judgment had not been used in acquiring this
5748 property of some 56 acres at the time we started the plant, we probably would be somewhat handicapped in attempting to obtain it today.

The Venice plant is located in the area referred to as Venice, Illinois, a little town shown on the map marked, as I said a minute ago, "B-S", being owned by the Union Electric Company of Illinois and located on the Illinois side of the river.

This plant, as now constituted, is just a moderate size plant with a total capacity of 62,500 kilowatts, and limited by a boiler capacity to 40,000 kilowatts, present output.

We can bring that up to 62,000 any time that it justifies the expenditure, but temporarily we feel that the immediate requirement is better served by the construction of a new plant adjacent to the present one.

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The basis of reasoning there is this: A 20,000-kilowatt gain in capacity is not sufficient to serve us even for part of a year at the extremely rapid rate at which the load is now growing under the National Defense requirements, and yet there have been times in the past, and there will be times in 5750
the future, when this 20,000 kilowatts—(I say there will be times in the future, there may)—when this 20,000 kilowatts might suffice for a year's growth.

At such times, that type of development will be economical and is contemplated, but at the present time we don't see any necessary or desirability of attempting to increase that boiler capacity merely because we have an extra 20,000-kilowatt turbine in the building.

The plant is connected, a distance of 4.8 miles, to Cahokia, as stated, by these two 66-000-volt circuits, and the 5751
cable circuits which I mentioned to Page Avenue are 7.94 miles long.

Some load in St. Louis is supplied by the 33,000-volt submarine, sub-transmission cables, that is, they are cables out of the Venice plant to the Missouri side, just as they are at Cahokia except there aren't so many of them.

The Illinois loads are supplied by four 66,000-volt overhead steel-tower transmission lines, two of which go north and supply the Alton district, and two go east and supply

the Illinois-Iowa Power Company, which was mentioned in the testimony this morning.

—2,487—

The Alton district is growing very rapidly and service in that district is rendered to various industries such as the Owens-Illinois Glass Company, an electric furnace project, and the Shell Oil Company refinery. This latter refinery has been growing at a huge rate for the past year, increasing their load by, roughly, almost 1,000 kilowatts a month. A
5753 year and a half ago they had a load of about 5,000 kilowatts, and they anticipate 14,000 by the end of next year. The load factor of that load is the highest that I have ever seen any record of, running 90 to 91 per cent. on the monthly basis, and apparently that will hold on an annual basis at the way they are going.

That is all you can do if you run the machine just as steady as you can all the hours of the year, because the little variations within the cycle account for the difference, and service requirements there are extremely rigid. We have a very enviable record with both the oil company and the
5754 glass company up there, both of whom have service requirements that are far above normal.

I think that it is well to mention at this point that if our service were to be totally cut off for any length of time from the glass company, and let the big furnaces with their molten glass harden up, they would have to be chiseled out at a huge cost; and the Shell Company has a number of operations in the refinery there which would represent extensive loss of

—2,488—

property, and even a hazard to life, if the service were kept

off for a very considerable length of time. They have actually some provision of their own for relief, but inasmuch as those things have never actually been tried out, there is always some question as to just how well they would work.

We feel very strongly the necessity for service reliability in the district. So far, we have had service up there for a number of years, and with great satisfaction. We can refer to both of those customers whenever we have any questions to discuss about service reliability. We have new equipment, good lines, everything the best there is, and a most elaborate 5756
relay protection system, everything is duplicated.

As a matter of fact, the St. Louis district would rank very high in the entire country if it were to be rated on the percentage of our lines that are duplicated to the customer.

We have a large number of radial circuits to which these large customers are connected on more than one, that is they have at least duplicate service.

I mentioned the proposed new plant at the Venice site immediately adjacent to the present building. We have a very valuable site of land there and are in the process of constructing a new plant whose ultimate rating is intended to 5757
be 400,000 kilowatts, and the initial step consists of two 40,000-kilowatt high-speed units, 850 pounds pressure, 900 degrees temperature.

That plant is expected to be in operation before the winter

of 1941. We are crowding it with all speed, and hope to do some testing in there not later than the first of September, next year.

There are a number of difficulties in a river plant that do not occur in a lake plant or in most of the eastern sea-

board plants where they have good rock foundations. We have to go down from 85 to 100 feet to get to rock, or depend on a floating type of foundation.

The Cahokia plant was built on what may be called a mattress, which is buried way down, and depends on the mattress and lots of piling, and then a big heavy sub-base, and then a concrete box; in other words, the construction corresponds to a battleship floating in sand, rather than in water, and has to be made self-contained, and has to be cal-
5759 culated to be sure that it won't float under flood conditions; it had to be calculated to be sure that it wouldn't float under the 1884 high water which went some 35 feet above our normal low water.

I actually made a calculation and found that if all the machinery were to be removed from the plant it would be theoretically possible for it to float, if you had the highest water that had ever been recorded.

Actually, there is no danger of it, but it was a calculation that had to be made. The difficulty of those foundations was considerable, and the expense was fairly high, and when
5760 we got to the Venice site we had 15 feet less.

—2,490—

Well, that doesn't sound like very much, but when you are driving 85-foot piles, another 15 feet might become an impossibility. We made a lot of test borings, and decided we would drive 12-inch steel piling with a special head on it, filled with concrete, and the result was successful, and we are driving those with great success and are delighted with having decided to do it. Two-thirds of them are already driven at the new plant, and there are only about two or

three firms in the United States that can do that kind of work, and it is a very great relief to us to know that we can go the 85 feet there and get on solid rock without having to work such elaborate precautions.

That plant should be as efficient as we can possibly justify, with our coal costs, and it is designed with every conceivable facility for a reliable operating plant.

We have reasonable expectations of getting the same type of economy that has been obtained in three or four other recent plants with machinery of that character. We gave 5762
careful consideration to the use of 1,250 pounds, 925 degree plant, but such a plant is so much more expensive to build than this type, is only slightly more efficient, and with our coal costs which are low, relatively, with relation to the eastern seaboard, we didn't feel that we could quite justify the expenditure. —2,491—

We also have to take into account the fact that a good part of the energy in our system is derived from water power, and that all of those things, taken into account, would cause us to select a plant which was most suited for the particular district, rather than the most highly 5763
efficient plant which could be theoretically built, in attempting to get the minimum cost of power, including fixed charges.

The next plant which I should like to describe is the Rivermines plant. It is located on this exhibit in the southern territory in St. Francois County, and is marked—it is a Union Electric Company of Missouri property, and is marked "A-S", the "S" standing for "steam".

It is a plant which was originally acquired from the St. Joseph Lead Company. At the time we built the Osage

project, or Bagnell Dam, we also acquired the load of the St. Joseph Lead Company in St. Francois County, the load brought about by their lead mining, and we acquired the plant and obtained their load. The plant was in good condition, with two 12,500 kw. units, and very quick to start, reliable, and we have retained the plant and have actually run it this year several weeks for peak reserve, and keep it in operating condition at all times.

It isn't a continuous operating plant, it is what we call
5765 a cold stand-by in most years. It would only be run in the year before bringing in a new plant. Do I make my point

—2,492—

clear when I say that these things are operated in the year just before bringing in a new plant?

That is to say, what we mean is that we utilize all of our reserve facilities in so far as we can so that we can schedule the bringing in of a new plant with perfect safety, but without getting it in before it is needed, because if we do, we are wasting fixed charges.

And in that way, we bring in the Osage project with
5766 its reserve cut-off feature, and have these other plants available so that if we were to lose one of our largest units, we could go right ahead.

And as the load approaches the point at which the loss of the largest unit would have any bearing on carrying the loan, then these plants are started up and run.

At this plant is a major switching station for the two 138 kv. circuits which go from the Bagnell Dam, or Osage, to Rivermines, that is, the southern route shown on Exhibit 51.

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At the Rivermines plant we not only have this major switching station, but two 25,000 k. v. a. synchronous condensers for controlling the operation of the transmission lines; and a very extensive distributing substation having an installed transformer capacity of 75,000 kilowatts, which serves the St. Joseph Lead Company, and which also serves as distributing sub-station for our own load.

You see we have, in addition to the Lead Company load,

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we also serve the area in all those small towns around there, 5768
so that this sub-station supplies all of those requirements.

We have five 33 kv. outgoing lines from that point for our own use, as well as a large number of cables supplying the Lead Company mines directly.

The service requirements there are again very rigid. Those mines are very rapidly operating mines, with high-speed hoisting, underground electric haulage of a good many miles, and they use a type of electric undercutting and digging machine which they themselves developed. It is a peculiar sort of a shovel. I have seen it work. At the end
of one of these mine tunnels, it is difficult to operate an 5769
ordinary type of machine, because your tracks have stopped, and you are blasting out ahead of your tracks, and you have got no supply or anything in the last 15 or 20 feet, that is, you are working up against a blind wall in which there will be a bunch of jagged rock as a result of a blast, and you have got to get out ahead of everything you are working with, or else use a hand shovel, which is the ordinary method.

Well, they developed a sort of an unloader, built it themselves, that corresponds to a small-sized steam shovel,

working with very limited room, which carries over the top and sticks out and picks up the rock, bringing it back over the top, between the top of the tunnel and the car, and drops it in the car behind them, and they build the tracks up as fast as it gets the rock excavated.

—2,494—

In the beginning they had lots of minor difficulties with the thing, one of which was that the men weren't particularly keen about it, that is, the miners themselves. They
5771 were afraid it might work too well; as a matter of fact, it did work well, and they are using a number of them right along, but they have also expanded their mining operations, and the miners' fears were unfounded. There are more miners working there today than in those days, and the machines are also working.

The pumping load down there is something of consequence. There are several thousand kilowatts used in de-watering those mines, and if those pumps were to stop for 18 hours, I don't know just how many hundreds of thousands of dollars it might cost to de-water the mines,
5772 but I should imagine that it would probaly cost somewhere in the order of a million dollars. There is very little danger of that, because there are so many sources of supply, and we have the local steam plant. And if a tornado were to take that plant out, we could get the lines rebuilt in less time than the water would become serious.

So neither they, nor ourselves, are concerned about it, but we have to have facilities, which we have.

Q. Now you have named the steam plants, and you have referred very briefly to the two hydro-electric plants. Could

—2,495—

you add, however, to the description of the Keokuk hydro-electric plant? A. The Keokuk hydro-electric plant, which was constructed and ready for operation the latter part of 1912, going into service in 1913, is a beautiful hydro-electric plant. I like to use that expression "beautiful", because I have seen a great many of them, and today it is one of the nicest looking and best constructed plants with which I am acquainted.

When you step into the main turbine room and look about
a quarter of a mile down the room, over 15 of these big units, 5774
it is quite an imposing sight.

Today you could build the same plant with larger units, and less of them, and it wouldn't be any better, it wouldn't be as good, because you have a greater chance of losing units then than we do up there. We have never lost any units accidentally in the life of the plant, and if we did, they are small and they wouldn't have any particular significance, and if such a plant were to be built today, with larger units, and fewer of them, the actual cost would be much greater than the cost was at the time, as far as the construction itself.

The reliability of that plant has been most remarkable. 5775
There have had to be some repairs on the dam, due to ice damage, but nothing of consequence, and the only equipment which has shown any particular signs of depreciation at all, has been the transformers, which have received very heavy, hard use, and a little at a time they are being replaced. They

—2,496—

were put in in 1912, and this is 1940.

Now that can be readily explained. In the St. Louis district anything put in in 1913 would have been obsolete today because of the changing requirements, the load increase—

everything is changing. Short circuits are increasing, oil switches have to be replaced, and many things have to be done which do not have to do with the depreciation, but rather obsolescence, whereas, in a hydro plant, you never can get any more out of it in the future than you did in the beginning, because the river doesn't change.

Consequently, those requirements remain practically fixed, and it becomes a case of wear-out only, and with careful maintenance, freedom from smoke and dirt that is asso-
5777 ciated with a plant of that kind, I don't know how long that equipment may last. But I have had some inspections made of the insulation and found it to be remarkably good. It is quite a tribute to the engineering that was done at that time.

Now the plant itself was designed for a head of 32 feet; a total installed capacity of 108,000 kilowatts, name-plate rating. The machinery has been operated all these years on a temperature schedule basis, in which the load given the machinery is determined by the surrounding temperature and certain other conditions, and we have had remarkable success with the generators, and when the water is available we
5778 rarely ever run them under 135,000, with a name-plate rating

—2,497—

of 108,000.

Q. Why do temperature conditions enter into a determination of the loading? A. Answering your question, the limiting capacity of any electrical machine is determined by the limiting temperature at which you can operate the insulation surrounding the wires in the generator or transformer. That sets the top temperature. Now the temperature rise in the machine has to be measured above the surrounding air,

or if it is a water-cooled machine, above the surrounding water temperature. The result is that in very cold weather a transformer setting outdoors could safely carry more load than it could in a very hot location. The result is that we prepared, as a result of experience and data, accumulated over years in St. Louis, and as a result of examining equipment which has operated for many years, and which has been taken out of service due to failures or for other reasons,—examined the condition of the insulation, and knowing the condition under which that machinery has been operated, 5780
we concluded that certain operations will not damage the insulation materially. We know, whenever we overload a machine, that we are going to get somewhat less life out of it than if we keep it below its rated load, but it is very frequently the case that you can carry more than the rated load without damaging the machine appreciably and thereby get

the most out of it over its life.

(Discussion off the record.)

The Witness: While we were discussing the capacity of the Keokuk machines being operated at a normal load of 135,000 kilowatts with a name-plate rating of 108,000, I should like to mention the condition that existed at the other end of the Keokuk transmission line, at the St. Louis end. 5781

There we have two banks of transformers rated at 56,000 k. v. a. maximum rating. They have blowers on them, and the blowers can be operated to obtain maximum rating. The operating department reported

5782 *Colloquy*

that we were from 2 to 5 thousand kilowatts short on capacity in those transformer banks, and we were losing a certain number of k. w. h. from the hydro plant by reason thereof.

The engineering department, over a period of several months, made a careful study of the design and characteristics of those transformers, and produced a table giving the operators a statement of what load they could put on those transformers at certain out-
5783 side temperatures, for so many hours. In addition to that, they made an equivalent table showing the number of k. w. h. that they could ta'e through them in any 24-hour period, as they have quite a heat capacity and it takes them quite a while to warm up, starting from cold.

The result was that they put that schedule into operation and hadn't been running more than ten days when the Keokuk operators called up and said

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that they were unable to deliver the capacity because
5784 of their own transformers. In other words, a scientific method of operating these transformers provided all the required capacity, and if you have today a couple of thousand kilowatts, and multiply it by the number of hours in a year, it runs into a good deal of money.

I want to bring that point out to illustrate the effective use of equipment, and to state that the customer has to take his own responsibility in making such decisions, and that very meager data is in general available from which to draw conclusions.

Now the Keokuk plant is connected, as I said without much detail before, to St. Louis by 110,000 volt, 25 cycle transmission lines, stated here to be 143 miles long. I have always regarded that as 146 miles long, but I think either figure is acceptable. It is connected at the Page Avenue sub-station in St. Louis, which I have previously located on this map.

The line is tapped to supply sub-stations at Hull,
Illinois; Meppen, Illinois, which furnish energy to 5786
the important loads at Quincy, Illinois; Ilasco, Missouri; and to the Alton and East St. Louis industrial districts.

In addition to the transmission circuits to St. Louis, the Keokuk plant supplies the City of Keokuk, Iowa, and surrounding territory, including a number of large industrial customers. These are supplied

—2,500—

through twelve 11,000 volt circuits—those are the same industrial customers to which we made reference this morning; two 33,000 volt circuits extend 5787
north to Fort Madison, which is indicated on this exhibit, to Burlington, Iowa, and supply service to that area, and to the Iowa Southern Utilities Company at Burlington, which was mentioned.

These circuits are carried on two separate single-circuit wood pole lines, one on each side of the river, to Fort Madison, a distance of about 20 miles; and from Fort Madison to Burlington, a distance of 18½ miles, they are carried on a double-circuit steel tower line which is designed for 66,000 volt operation.

5788 *Colloquy*

The plan is to, when required in the future, rebuild the present circuits from Keokuk to Fort Madison for 66,000 volts, and then we will have continuous, one continuous 66,000 volt line all the way from Keokuk to Burlington.

At Fort Madison, the service is in the process of being changed from 25 to 60 cycles, that is, for the town itself, and two frequency changers are being installed, and the entire load in the area, with the
5789 exception of a few industrial loads, is being cut over to 60 cycle service. The cost of this, and certain other comments, will be brought up again later.

The single-circuit 33,000 volt wood pole line extends out and supplies service to the Missouri Power & Light Company. That was mentioned this morning,

—2,501—

but I want to get them all in here at this time. That was this line shown on Exhibit 52-B, as coming out from Keokuk, and it has a statement here, "To Missouri Power & Light Company".

5790

The Illinois-Iowa Power Company—all of these companies having been mentioned this morning, but no further information was given as to how they acquired their power—purchases energy at Hamilton, Illinois, which is across the river. The dam extends across the river, and the cable and circuits go across in the dam, to Hamilton. And the energy is converted over there to 60 cycles and transmitted over a 66,000 volt double-circuit line, eastward through Illinois, by way of Galesburg, toward Kewanee.

The Illinois-Iowa Power Company owns the frequency changers.

The Central Illinois Public Service Company was also mentioned earlier, and it acquires its supply at Keokuk, Hull, Quincy and Meppen, and converts it to 60 cycles, and supplies the western portion of this Illinois system. They also have frequency changers at those places, which are owned by themselves.

I would like to correct that statement; those are
owned by the Illinois Public Service Company, the 5792
one to whom they sell some power. That company has
not been previously mentioned. It isn't one to whom
we sell direct.

I believe that about covers the Keokuk plant.

Q. Will you add to your previous description of the Osage

—2,502—

plant? A. The Osage plant is located on the Osage River,
near Bagnell, Missouri, 46 miles south of Jefferson City.
The dam is a gravity type concrete structure, 2,543 feet long,
148 feet high from bed rock to the highway deck. The 5793
reservoir covers an area of 95 square miles, is 129 miles long,
with a shore line of 1,300 miles. The designed head of the
plant is 90 feet. We usually run over that head, but that is
the head for which it was designed, the one for which the
wheel itself is designed. It operates better, of course, at a
higher head, and we lose power at a lower head.

Each of the six units is rated at 21,500 kw., to give a total plant rating of 129,000 kilowatts. Now that brings out the limitations of the name-plate rating. Those wheels can be

operated at 26,500 kilowatts at a little higher temperature, and as a matter of fact they are generously designed, and we can run them at 30,000 continuously, without ever reaching the designed temperature.

So there is no limitation whatever in the wheels, and the rating of 21,500 doesn't have any bearing on what they can do.

Our normal output there is usually taken as about 130,000 kilowatts. Energy is transmitted to St. Louis over the two
5795 routes previously described. Those transmission lines themselves will be more fully described at a later discussion of

—2,503—

the transmission system.

Now I have covered the description of our major power plants, but we have one sub-station which is of so much importance in our system that I would like to describe it along with the power plants, and if I may, I would now like to describe the Page Avenue sub-station. It has already been located on the map.

The Examiner: We will take a short recess.

5796

(Whereupon, a short recess was taken, after which the hearing resumed.)

By Mr. Hamilton:

Q. Will you resume with your description? A. This substation, which is located just outside the western city limits of the City of St. Louis, in St. Louis County, is the terminus for two 138,000 volt transmission lines from the Osage hydro plant, also the terminus for the two 110,000 volt circuits

from the Keokuk plant; is also connected to the Venice plant by two 50,000 kilowatt, 66,000 volt cables; and by a continuation of the same cable route, on overhead circuits, from Venice to Cahokia, as described previously, it is also connected to the Cahokia plant.

The result is that there are four power plants which can feed their output into the Page Avenue station. We distribute, for residential and commercial purposes, about 27,000 to 30,000 kilowatts of load at that point. We also
distribute, at 25 cycles, several thousand kilowatts of in- 5798

—2,504—

dustrial load, which goes to some cement companies, and to the railway company.

Thus, the station is a most important feature of our system, and we have to be very careful in the design of all of the equipment there to be sure that we avoid a fire risk or failure of any kind, and everything is duplicated.

The yard around the plant is quite extensive, and is conveniently filled with transformers. If you were to stand on a viaduct overlooking the plant, it looks like a forest of
transformers and radiators. There are actually 404,500 5799
k. v. a. of transformer capacity in the station, most of which is in the yard.

In addition to that, there are 60,000 kilowatts of a particular type of frequency changes. This group of transformers, which I believe is about as big an aggregation as you would ever find in any one sub-station, is at all voltages from 138,000—60 cycle, to 66,000—60 cycle; 13,200—60 cycle; 33,000 volts—60 cycle; and 110,000 volts and 13,200 volts—25 cycle. We have all those voltages and frequencies,

5800 in addition to which we transform to a distribution station in the same yard, and distribute through a multiplicity of feeders at 4,150 volts. That 4,150 volts is usually referred to as 2,300/4,000 distribution. The individual single-phase circuits are 2,400 volts at the customer.

—2,505—

The frequency changers are known as Scherbius types, and were first developed for application in the steel mills on a little different basis, but the principal was interesting, and
5801 in our case it was almost essential that we use that type of machine, which costs more than an ordinary frequency changer.

I will explain that as well as I can. The 25-cycle system at Keokuk is a right extensive system. It also has possibilities of being interconnected with other systems of even possibly larger magnitude. The 60-cycle system is already extensive, having several hundred thousand kilowatts of 60-cycle generating plants connected to it.

The result is that any machine placed between those two systems will be subjected to a tremendous twist or torque
5802 if there were a short-circuit or shift in frequency on either system.

Investigations were made to determine what type and size of frequency converter or frequency changer—which is the same thing—could be adopted. If we used a straight synchronous-synchronous set, the calculations indicated that we would twist the shaft off on any machine smaller than probably 40,000 kilowatts, and if we were to put in 40,000-kilowatt machines, which we didn't need at the time, we only needed 20,000 to begin with, that if any extensions were

 5803

made to either system, such as the plant we are now building on the 60-cycle end, or if some connection were made to the Keokuk system through other utilities, and the requirements would then be increased, that that machine would be inadequate. —2,506—

So we investigated the possibilities that this other type of machine which is known as a slip frequency converter, which does not rigidly tie the two systems together, but permits a transfer of power between the 25 and 60 cycle systems, at the same time allowing the same to slip, with respect to each other. 5804

It has one what might be called disadvantageous feature, really it isn't from our viewpoint, namely, that the time on the two systems cannot be controlled from the other. That is, if we have clocks on the 25-cycle system, you couldn't control them from your 60-cycle system because this slip frequency converter would allow the frequency to vary. So we have to control the time on each system independently. That is a difficulty.

These two converters, which were first installed in the Page Avenue station in 1929, also contain in the 60-cycle end 15,000-k. v. a. condensers each, or a total of 30,000, which are used to operate the Osage-Page Avenue circuit. In other words, they act as independent synchronous condensers would do, and thereby we were able to economize and avoid having to purchase separate condensers for operating the line which we would otherwise have had to do. And at the same time, we get the benefits of the conversion from 25 to 60 cycles, or from 60 to 25 cycles. 5805

5806 *Stanley Stokes—By Respondents—Direct*

Now these machines were put in, as I say, at the time when the load was growing most rapidly, toward the end of 1929, and were intended to operate in either direction, but primarily were expected to furnish Keokuk with 25 cycles additional reserve from our 60-cycle system. In other words,

—2,507—

it is much cheaper for us to generate at 60 cycles, and then put the current through these frequency changers whenever it is required, because we can use them in the reverse direc-
5807 tion as well, than it is for us to produce at 25-cycle generation.

The load at Keokuk had been growing rapidly, and these machines were supposed to give the additional assistance.

At about the time we completed the installation of these machines, the depression came on. With us it didn't really hit us until toward the end of 1930, because we were in the process of adding on the St. Joseph Lead Company load and certain other changes which carried our load on for almost a year after the break in 1929; but it ultimately got to us, that is, the depression, and the big industrial power cus-
5808 tomers at Keokuk reduced their operations, just quit.

During the years following that, in the depression, we would have lost a very large amount of water power which would have had to have gone over the dam and be wasted, for the simple reason that our night load and part of the time our day load would not have been sufficient to use it up at 25 cycles.

These machines, working backward from the most frequently contemplated method, that is supplying from the 25-cycle to the 60-cycle system, produced during that depres-

sion period a very large amount of energy; a total of 964,000,000 kilowatt hours of Keokuk power have been converted to 60 cycles, and 692,000,000 k. w. h. have been supplied to

—2,508—

the 25-cycle system from the 60-cycle generating facilities.

Q. During what period was that? A. Starting at the time they were installed, or shortly after, practically in 1930. They were installed in the latter part of 1929.

Calculating the earnings from this interchange over a
10-year period, we estimate that the machines have actually 5810
saved, for the Union Electric Group, more than $2,000,000, to say nothing of the value of the reserve capacity to the 25-cycle system.

I may say that that was a great deal more than we had expected when we installed them.

The result was that at the end of either 1937 or 1938—and if it is important, I can identify the date—we decided to put in an additional machine similar to the previous ones, but of somewhat larger size, due to a change in design and to include more what we call 60-cycle corrective capacity.
It acts as about a 25,000 to 30,000 synchronous condenser, 5811
and will transfer 20,000 kilowatts either way in addition. That machine was installed and has operated beautifully. We had considerable difficulty with the others to begin with, due to mechanical breakage, but the new one is a very perfect device. Those machines represent one shaft with about seven independent units on it. It is, roughly speaking, 80-some-odd feet long, and would not go in this room. It has a 25-cycle generator, a 60-cycle generator, a unit known as a converter unit, a regulating unit, and an exciter, and

—2,509—

5812

a high-speed exciter known as a pilot exciter—all mounted on one shaft.

It is a very interesting machine. I don't know that it has any particular bearing here, but it is indicative of the increasing cost to state that the machines in 1929 cost us \$292,000 apiece, to purchase, and when the quotations on this machine were running up into very much higher figures, a quotation was requested on a duplicate of the 1929 machine. That was received, and it was \$456,000. The
5813 actual price paid for this last machine was somewhat more than that because it was larger.

Along that same line, a recent inquiry was made as to what we could purchase one of the water wheels for the Osage hydro-electric plant for. They cost us \$175,000 when purchased somewhere around 1932. The proposal was for \$300,000, indicating the extent of price increase in some of the lines of this equipment.

The Page Avenue sub-station is an indication of what modernization can do in a plant. To begin with, it was
5814 designed to have a total capacity of 60,000 kilowatts, of 25-cycle power, and twelve 5,000-kilowatt single phase transformers. Each of those transformers was a huge device, much higher than this room, with tall bushings, and bushings made out of paper slips, the best they could do in those days. They were indoor transformers and couldn't be operated outside because nobody knew how to develop bushings that would stand the outside. —2,510—

In that same area, the same building, with some extension, we now have the 404,500 kilowatts of transformer

capacity which were referred to here, plus these frequency changers, plus a large size distribution station for outgoing regulated 2,300/4,000-volt circuit. The original transformers, of course, were removed from within the building, and we took the place of twelve 5,000 units with two 3-phase units out in the yard, which occupy some ten per cent. of the yard. Then the space which was made available in the building was changed around and a floor added, and a 60-cycle bus structure installed in the second floor, and additional structures in the first floor, and a little at a time it 5816
has become a modern power plant of today's vintage.

So that shows what the changes in the art have amounted to in that period of time.

Q. Have you any idea as to the amount of investment represented in that sub-station? A. I don't know whether I can approximate it or not, it is a figure that would be readily available, but I am not sure that I have it with me.

Q. Just leave that then for the time being. A. If it is important I will make a note, and get it. I don't like to guess at it at all. I can state what the last frequency changer job cost. That was $840,000, including the building, 5817
equipment, transformers, and so forth. The transformers that received the power from Osage, receiving terminal

—2,511—

equipment, cost $161,000 per bank, and relatively the total investment out there must represent—oh, I would estimate it roughly as three or three and a half million dollars, something on that order.

Q. Now what has been the record of the Union Electric Group with respect to its growth in generating capacity over a period of years? A. The load has grown, and the generat-

ing capacity has kept up with the load growth. We had 143,500 kilowatts in 1913, and that has grown to this figure of 722,500 kilowatts name plate rating with an effective dependable capacity of 630,000 kilowatts by 1940. The growth has been fairly steady and rather uniform. As a matter of fact, from 1911 about, to the World War, or even beyond, I would say from 1911 to 1924, our system load, when plotted on logarithmetic paper, has almost exactly followed a straight line for all of those years, and the slope represented
5819 doubling every seven years or thereabout. In other words, it doubled consistently about every seven years from 1911 to about 1924.

Then it started to increase there for a while a little more rapidly, and then came the depression. Since 1934, about, the rate of increase is again fairly uniform, part of which is accounted for by recovering load lost in the depression, and the rest of it is due to added load.

At the present time, the total system is growing at about

8 per cent. per annum, but we have to anticipate the possi-
5820 bility of almost a 10 per cent. growth a year for the next two or three years. It seems necessary to base our power plant program on such a possibility.

Q. 10 per cent. a year, you mean? A. For the next couple of years. By that I mean, to make the statement a little more exact, we have decided that in installing this equipment at Venice, and subsequent equipment, that for the period of the next two or three years we will set up a power plant program based on 10 per cent. system growth, but will calculate the economies of operating units on a basis of 8½ per cent. growth. What that means is simply this, that the possibility

of large chunks of National Defense load is so imminent that we have simply got to have a little more latitude in our construction program than we really expect for operating purposes.

So even though we are planning this program on a 10 per cent. basis, we don't feel quite justified in calculating the actual load itself on that basis, but we do need a little insurance, a little leeway.

There are two or three single loads being considered that we don't know to what extent they may grow. For example, 5822
we have no way of knowing whether this wind tunnel which the Government has been considering at various locations, and which is still being discussed—we have to consider the possibility that they may be located there; and we have to

—2,513—

observe the Curtiss-Wright situation where they can readily add 5,000 or maybe 10,000 kilowatts—and those two figures, together with the possible industry location here of 20,000, would themselves total 50,000 kilowatts right there in three items.

Now they may come all at once. The result is that there 5823
doesn't seem to be anything to do but to plan for it, and then slow down as soon as we have any knowledge of the facts.

The Examiner: Mr. Hamilton has another matter before the Commission that he wants to attend to at this hour, so we will recess until tomorrow morning at 10 o'clock.

(Whereupon, at 4:05 o'clock, p. m., the hearing was recessed until 10:00 o'clock, a. m., Tuesday, October 22, 1940.)

5824 Before the

Securities and Exchange Commission

Docket No. 59-10

In the Matter

of

The North American Company, *et al.*

5825

Hearing Room 1102-A,
Securities and Exchange Commission Bldg.,
Washington, D. C.,
Tuesday, October 22, 1940.

Met, pursuant to adjournment, at 10 o'clock a. m.

5826 Before: W. W. Swift, *Trial Examiner.*

Appearances:

S. Pearce Browning, Jr., and Charles S. Hamilton, Jr., of Sullivan & Cromwell, 48 Wall Street, New York City, Attorneys for the Respondents.

Ralph C. Binford and Arthur J. Buswell, Attorneys for the Securities and Exchange Commission.

PROCEEDINGS

The Examiner: The hearing will come to order.

Mr. Hamilton: Will you resume the stand, Mr. Stokes?

Whereupon, STANLEY STOKES resumed the stand and testified further as follows:

Direct Examination by Mr. Hamilton (Continued): 5828

Q. At the conclusion of the hearing yesterday, Mr. Stokes, I think you were in the process of describing the development in generating capacity of the Union Electric Group from 1913 on, and had given some figures in that respect. Will you continue your statement? A. I believe I stated that in 1913, we had a capacity of 143,500 kw. which, by 1940, had grown to 630,000 kw.

The process by which this growth took place is worth a little mention. In 1913 we had service from Keokuk and Ashley steam plant. By 1920, this service, which was originally 143,500 kw., had grown to 160,000. That was primarily 5829
due to the addition of a 20,000 kw. unit at the Ashley Street station, together with certain other withdrawals as the boilers and units began to get old.

By 1925, the total had become 284,000. This large increase started in 1923, with the addition of the Cahokia station, whose first section was built in that year.

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In 1924, there was an addition of a 35,000 kw. unit at Cahokia, and another one in 1925. The figure again increased from 1925 to 1930, from the 284,000 to 435,000 kw. That was

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the result of several changes, including the acquisition of the Rivermines plant.

Now in addition to that, there was an addition to the Cahokia plant in 1927 of 50,000 kw.

Referring to the previous statement of capacity of 435,000 in 1930, in the following year, 1931, this changed to 550,000 due to the addition of the Osage hydro-electric project.

Coming up to 1938, we increased the rating of the Osage project by 15,000 kw. This change was not a change in the
5831 physical property at Osage, but a change in the size of the system load with resultant effect on the duration curve, which permitted Osage to increase its annual peak cut-off by that amount. This was in accordance with the original plant at the time the plant was built, in which we first rated combined hydro at 185,000, then at 200,000, and ultimately at 225,000, above which it will not be carried.

It of course must be understood that as these ratings for peak output are increased, the hours of use have to be correspondingly reduced, because the total k. w. h. is practically a constant.

5832 By the year 1940 we had attained a total of 630,000 due to a combination of minor changes, removal of a 5,000 kw. unit from the Alton steam plant, and an increase of boiler

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capacity at Ashley Street.

That is about the history, roughly, of the development.

Q. Now I think it would clarify matters somewhat at this point, if you would state the year of installation of each of the units in each plant, and at the same time indicate the capacity of each unit, and the voltage at which current is generated, and any other information which seems to you

appropriate. A. The first plant to be described is Cahokia. The units in these power plants are given numbers. When I say No. 1, that is the number by which that unit is referenced.

Unit No. 1 is a 75,000 kw. unit, installed in 1929. It has a power factor of .9. All of the Cahokia units are of the same voltage, 13,800 volts, and the frequency is 60 cycles. No 25 cycle equipment is located at Cahokia.

Unit No. 2 is rated at 30,000 kw., has a power factor of 85 per cent. In expressing power factor, it is proper to say
either 85 per cent. or .85, either is all right in this case. The 5834
year of installation was 1923.

No. 3 unit—35,000 kilowatts; the same frequency and voltage as previously stated, and .95 per cent. power factor, installed in 1924.

Unit No. 4—35,000 kilowatts; power factor .855; installed in 1925.

—2,518—

Unit No. 5—50,000 kilowatts; power factor .9; installed in 1927.

And the last unit, No. 6—75,000 kilowatts; power factor .8; installed in 1937.

Now I should explain at this point why Unit No. 1 hap- 5835
pens to come in there in 1929, while No. 2 was installed in 1923. Unit No. 1 was installed in place of an original unit No. 1, a 30,000 or 35,000 kilowatt turbine, which was removed and installed in a plant at Venice, the new turbine setting on the same foundation as the old one, with some additions to it.

It was found possible, by moderate changes in the foundation, and miscellaneous building equipment, to accommodate a 75,000 kw. turbine in the location and with the facilities originally provided for a 35,000 unit. It of course required

a new condenser, new pumps, and increased capacity of boilers.

At about that time a better method of arranging the furnace walls in boilers had been discovered, and due to this improvement it was possible to get more capacity out of the boilers by a moderate rebuilding program. Naturally, this served to reduce our unit costs to obtain 75,000 kilowatts, whereas previously we had only had 35,000.

Q. Now in the case of Cahokia, the aggregate name-plate
5837 rating is the same as the aggregate dependable capacity? A. That is right, that is an unusual condition, where you can

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rate your plant in total for practically all requirements equal to its combined name-plate rating.

We are not quite certain of our ground to go any higher than that, but we have reasonable assurance that we can increase that rating slightly in the wintertime, and we are not quite certain yet, because of lack of experience with the last installation, as to what the limitations are. I personally feel that the turbines in that plant could probably be driven
5838 to considerably above 300,000 in cold weather, when the condensing water is cold, but I do know that the boiler limitations at present would not permit that.

We are installing some thermo-couples and other measuring equipment to try to learn as much about the actual capacity of this equipment as we can. That, of course, gets back to a matter of rating equipment, and a manufacturer can only state one set of conditions at which his machine will operate when he puts a name plate on it, and that is the set of conditions for which the machine is designed. In actual

practice, there are many other sets of combinations of circumstances which may cause that capacity to be either higher or lower than its name-plate rating, and when you come to a large system, that is a matter of considerable consequence.

The system power factor as a whole is approximately .9, at times of peak load, and goes down to a considerably lower figure at light load periods. We have, however, in recent

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years, installed a very large number of capacitors on our
distribution system, which, a little at a time, are improving 5840
the power factor.

The application of synchronous motors, by a good many of the industrials, and particularly in connection with some air-conditioning work, where large units are being installed —those synchronous motors are of material assistance in power factor improvement.

In general, we have a rather satisfactory power factor situation at St. Louis.

Now, taking up the next plant, the Ashley Street plant, which has been previously discussed, its Unit No. 1, rated at
10,200 kilowatts, 60 cycles, .8 power factor, was installed in 5841
1921. The voltage of that unit is 4,500 volts, and it is used to feed directly into the distribution system for general purpose use.

Unit No. 3 (Unit No. 2 having been removed at some point, or the numbers changed and no longer exists)—12,000 kilowatts; 6,600 volts; 25 cycle. This is a unity power factor generator installed in 1910.

Unit No. 4, and Unit No. 5, are duplicates, installed in 1910 and 1911, No. 5 being in the latter year. Those machines are operated in conjunction with our 25 cycle power received

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from Keokuk. The major use of this power is for the supply of the railway load (street cars), in the city, and also to

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supply our so-called Edison sub-stations, which convert the 25 cycles to direct current.

No. 7 machine, a 20,000 kilowatt machine, 4,500 volt turbine, at 60 cycles, has a power factor of .8, and was installed in 1917.

No. 6, which I passed over, was a 12,000 kilowatt machine,
5843 4,500 volts, 60 cycles, unity power factor, installed in 1910.

Those two machines operate with No. 1 to supply normal distribution requirements on our radial system.

Q. At what voltage? A. 4,500 volts. That is No. 1, No. 6 and No. 7.

No. 8 is a 20,000 kw. turbine, at 6,600 volts, 25 cycles. This machine has a power factor of .9, and was installed in 1920. It operates with Nos. 3, 4 and 5, previously described, and in the same manner.

Q. And at the same voltage? A. And at the same voltage.

5844 No. 9 is a 20,000 kw. turbine, at 13,200 volts, 60 cycles, and a .8 power factor, installed in 1920.

This completes the individual machines in Ashley Street.

Q. Now summarize, if you will, for Ashley Street, the name-plate rating and dependable capacity? A. That totals 98,000 kilowatts of name-plate total capacity. The dependable rating is 65,000. That is limited by boiler capacity. A turbine is constantly kept in repair and rebladed, and can

—2,522—

be maintained in its original operating condition, as far as

satisfactory, reliable service is concerned. Boilers cannot. Boiler tubes can be replaced, but the time comes when the boiler setting, bracing, and other features, have depreciated to the point at which the steam pressure has to be lowered, and hence those boilers have to be removed and the turbine is still good.

So that the capacity of the boilers has declined to the point at which we rate the plant at 65,000. Among those boilers, however, are two new 300,000 pound per hour units, which are now being installed and will be ready for opera- 5846
tion this winter. The plant supplies, in addition to its electric requirements, some steam heating load, which will be discussed more in detail later, and that accounts for the installation of these boilers to a large extent, that and the most attractive location of this whole plant in the center of the city, which makes it very suitable for reserve operation.

The next plant to be described is Venice. It has three units.

No. 1—20,000 kilowatts; 13,200 volts; 60 cycles; 95 per cent. power factor, installed in 1924.

No. 2—35,000 kw.; 13,800 volts; 60 cycles; and 95 per 5847
cent. power factor, installed in 1929. That is the unit which was removed from Cahokia, as described previously.

No. 3—7,500 kw.; 2,300 volts; 60 cycles; and .95 power

—2,523—

factor; put in in 1919. This last unit is a very reliable little turbine, and is particularly useful as a secondary source of power supply for the auxiliaries in the event of failure of the main source. It also can be used on peak to add its increment to the total.

Q. Now in each case, if you will, will you summarize for each plant the dependable rating and the name-plate rating? A. The total name-plate rating of that plant is 62,500 kw., and it again is limited to 40,000 kilowatts by boiler capacity.

At this point I should like to make a little explanation of this plant. The 20,000 kw. unit is a modern type turbine designed for 350 pounds pressure at about 750 degrees. There are two very high-grade, relatively new boilers in the plant. We will, at some day, add boiler capacity to bring
5849 this turbine up to its full pressure. At the present time it is operating at reduced pressure. But the size of the net gain in capacity is so small that at the present time we have decided to give precedence to the construction of a new and larger plant, and let this go until it seems to be the most economic time to install it. Along with it, we contemplate the possibility of adding an additional wheel at the Osage plant. Those two, working together, will add about 35,000 kw. to our system capacity, and this will undoubtedly be an economical move at some future date.

—2,524—

5850 The next plant is Rivermines. It has two units installed; One, No. 4, the first one, 12,500 kw.; 7,200 volts; 60 cycles; and .8 power factor; installed in 1923.

No. 5—12,500 kw.; 7,200 volts; 60 cycles; 80 per cent. power factor; installed in 1925.

These units are in first-class operating condition. They haven't received a great deal of hard use, and we have recently spent considerable money on the boiler plant and consider that plant, which totals 25,000 kw. for the two units, to be a thoroughly reliable, quick-starting, satisfac-

tory reserve plant to be brought into operation whenever required.

It has, for several years, been carried as what we call cold stand-by, that is, shut down, ready to start, but not running. It has, however, been run some this fall.

The dependable capacity is also 25,000.

I might summarize the combined steam plants there, which total, in name-plate rating,—485,000 kilowatts; with a dependable capacity of 430,000. 5852

I might as well go right ahead and describe the Keokuk plant. It contains units numbered 1 to 15, inclusive, 15 units in total, each of 7,200 kilowatts; 11,000 volts; 25 cycle; and .8 power factor; installed in 1913. That makes a total installed capacity, name-plate rating, of 108,000 kilowatts.

Before discussing the dependable capacity, I want to describe the Osage plant. —2,525—

It contains units numbers 1 to 6, inclusive, 6 units in total, of 21,500 kilowatts each; 13,800 volts; 60 cycles; and .8 power factor; installed in 1931. Those turbines have a 5853
dual rating at either 21,500, or 26,000 or 27,000, depending on the temperature. It is what is known as Class B, or Grade B insulation, mica, and 80 degree Centigrade operation will not deteriorate it.

The combined name-plate rating of those two plants is 237,000 kilowatts.

I could put in a statement as to the maximum output we have obtained from them, which I believe has been 160,000 out of Osage on a short-time peak, and 135,000 from Keokuk, but the two, taken together, are given a dependable rating

of 200,000 kilowatts for annual peak for cut-off purposes. This has been mentioned to some extent previously, and in the discussion which may follow on operations, I would like to mention it again.

The rating of a combined group of hydro plants, one of which operates on stream-flow, and takes the run-of-river, and the other which operates on a storage basis, can be given almost as many ratings as one wants to. Each rating depends entirely upon the purpose for which the plant is to be
5855 used, the time of the year, and the length of time for which it is to be run. It is a very difficult thing to rate that type of a plant. —2526—

Q. Now state, if you will, the aggregate book value of the electric generating facilities of the group? A. The total investment in these plants at the end of 1939 is approximately $103,400,000, as taken from the company's books. The division of that investment is: Ashley Street—$10,700,000; Cahokia — $32,100,000; Venice — $5,100,000; Rivermines — $2,900,000; Osage — $31,500,000; Keokuk — $21,100,000.

5856 Now these figures are the net investment in power plant facilities only for electric purposes, and do not include any transformers, substations, or other equipment which is actually contained even within the plant. It is a specific designation up to and including the buses. Those figures may be increased by a large percentage when all other factors are included. As a rough example, I think that the Cahokia figure of $32,100,000 would, if the sub-stations and other equipment in the yard were to be included, amount to somewhere between $37,000,000 and $38,000,000. Likewise for the other plants.

The development of the electric light industry in St. Louis was quite early. I don't know the circumstances which brought it about, but I do know that the only cities that were mentioned as having electrical facilities in 1890, in the 1890 Census, were St. Louis and New York. The first plant in St. Louis was an arc-light machine, imported by a famous restaurateur, Tony Faust. He had a rather famous restaurant for many years in the early days. That machine was brought over from Paris by him in 1878, and in the

ensuing 20 years there were a number of so-called systems installed in St. Louis, and the art developed very rapidly.

I would like to give this little connection with these other plants to illustrate, along with the growth of the load and the installation of these various units, a little background to go with it.

By 1898, one of our predecessors, the Missouri Edison Electric Company, could claim such outstanding achievements as the operation of alternating generators in parallel, the use of induction type feeder regulators, the distribution of power by an AC network, and the operation of the world's 5859 largest AC arc-light station. The company had a load factor of 20 per cent., as compared with our 60 per cent. load factor of today.

The discussion and mention of all of the different systems entering into the present Union Electric Company of Missouri, is a very interesting chapter, and contains a long list of names of companies, which I will not attempt to detail at this point.

The Union Electric Light & Power Company was organized in 1902, and had three power stations, A and B, and

Ashley Street. One of those stations, Station B, is now used as a storeroom, and the old foundations of the old Edison machines can still be seen back in one of the buildings.

—2,528—

Station A has completely disappeared as far as any equipment is concerned, and with all of the later acquisitions and consolidations, the company has now become the present Union Electric Company of Missouri.

I should at this point mention the new plant which is
5861 now under construction on the Venice site. It will have two 40,000 kilowatt units initially, and will be designed for an ultimate of 400,000 kilowatts.

Q. And those two units which you have just referred to, are in addition to the references to the capacity of the Venice plant previously mentioned? A. Yes. We will distinguish those Venice plants by referring to the present existing plant as Venice Plant No. 1, and the new plant which is now under construction as Venice Plant No. 2.

Q. I don't think you mentioned, Mr. Stokes, the Cupples generating station. Do you want to refer to that very
5862 briefly? A. The Cupples Station is a very small plant which our people in the engineering department neglect entirely in our consideration of the plant as a whole. We have a steam-heating connection to what is known as the Cupples block, it is a block of buildings in the downtown area of St. Louis, owned by Washington University, and we supply steam to heat some of those buildings, and that steam is taken from our regular steam mains, and because the machinery was already available, and because they needed some method

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of reducing the steam pressure down to the heating pressure, it is put through a small 420 kw. generator and runs when the steam-heating season is in operation. It would have no effect on our system capacity. The energy which may be generated by this little machine is fed back into the Union Electric Group system.

Q. Now are these generating plants interconnected? A. They are, they are interconnected with both cables and overhead lines of considerable capacity.

The interconnection between these plants has been made more than ordinarily heavy. By that, I mean that the size of wire, such as 300,000 circular mil conductors, and voltages of from 33 to 66 thousand volts, with short distances, permit the transfer of rather large blocks of power between plants. 5864

The necessity for such high capacity provisions is primarily brought about by the desirability of obtaining power from the hydro plants and distributing it to any point in the system, and particularly to be able to get it to the major steam plants. When the hydro system has its maximum capacity, the steam plants have to stand by, and when it is at the lowest point, they have to run at capacity. 5865

Having provided this interchange of capacity between plants, it has many other useful purposes. It acts to supply reserve from one plant to another, as the result of the sudden loss of a unit; it permits the Osage plant to pick up loads

quickly in emergencies, which can not be done by a steam plant. The reservoir at Osage is at all times able to handle more load than is usually being carried by the plant, and for

periods of a few days to ten weeks, this plant can act as what is termed spinning reserve.

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We have even gone so far as to provide some automatic equipment to permit the generators at Osage, or at least two or three of them, to be motored, that is to operate as a motor, being driven from the rest of the system, and we open the gates and let through just enough water to keep the bearings cool and keep the machines operating properly, and also meet
5867 the Government requirements of minimum stream flow.

Under these conditions those wheels can come up from carrying practically no loads to full loads, in a matter of theoretically almost seconds, actually we don't depend on them under about two to three minutes total, but they have actually functioned in less time. Now that type of reserve is very convenient.

In addition to that, the capacity of the various transmission lines permits the diversion of power from one part of the system to another. Our main transmission lines are of very modern construction and in a number of cases are com-
5868 pletely equipped with load ratio control transformers. These will be described a little more later but they permit changing the ratio of transformation while under load, without the necessity of taking the transformer off to do it. This sort of a device is expensive. We have just included one on each of the four transformers being purchased for the new Venice plant, at an additional cost for the four of around $160,000. That is for the facilities alone. That does not include the transformer.

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An example of the use of such a transmission system in providing reserve is, I think, of interest. On May 13th, 14th and 15th of this year, we had a situation exist in the Mississippi River which had never occurred before, and we have had plants operating on the river, as indicated here, all the way back to 1902.

At the time we didn't know what was going on, but all of a sudden leaves and trash, and debris of all kinds just came down in a flood, started without any notice, and stopped up the condensers. We have the latest type of 5870 rotating screens to prevent debris of any kind from getting into the condensers. These are so-called travelling screens that act like a chain belt, going over a roller and down into the water and back up again, and the water flows through this screen, and as the screen reverses at the top and starts down there is a spray of water to wash it off clean.

These leaves and trash came in, in such a volume that they went right over the screen, and the stream of water couldn't wash it off the back side and they got on the other side of the screen and into the condensers. And without any particular warning, unit No. 5 had to be shut down 5871 twice on May 13th. On May 14th, unit No. 5, that is a 50,000-kw. unit, had to be shut down——

Q. (Interposing) At what plant is this? A. Cahokia—that had to be shut down three times; and on May 14th, unit

No. 6, a 75,000-kilowatt unit, had to be shut down twice.

On May 14th, unit No. 3 had to be shut down twice.

On May 14th, unit No. 4 went down twice.

On May 15th, unit No. 4 was down once.

On May 15th, unit No. 6 had to be again taken down.

Each time, to clean the leaves and trash out of the condensers. Now that is a pretty severe situation when you realize that 75,000 and 50,000 and 30,000 kw. units were going down fast. Each shutdown was for a period from two to two and a half hours minimum, in which the condensers could be cleaned and the capacity of the remaining units was reduced by the gradual impeding of the flow of water
5873 through the remaining units. During this entire period of disturbance it was possible to pick up the load at other plants through the transmission system without any outages whatever to customers.

The Osage plant functioned beautifully during this particular period. So that the investment in these tie lines as we call them, which is justified as a necessary expense of transferring hydro power, has an extremely important part in the general operation of the system, as well, and serves for reserves, transfer of loads, reduction in standby operating expenses. If we didn't have these circuits as exten-
5874 sively as we have, we would have to operate more machinery in the older plants for reserve purposes.

—2,534—

Q. Would you say then that the fact of the interconnection of these generating stations results in economies of operation? A. It does, that is the tie lines naturally provide certain increased fixed charges which exist, and which would not exist if we didn't have them, but the other side of the story is that they serve to make a general overall economy for the system and are, in addition to that, a major source

of safety to the operation. If the economy in the operation of these circuits merely balanced the fixed charges, we would have an insurance factor for service that could not be overlooked.

Q. Is it, or is it not a fact that power from any of the generating stations can be made available to any part of the electric service area of the Union Electric Group by means of the transmission line connections? A. It can, to the extent that the capacity of the lines permit, and that is a considerable portion of the total. For example, the 5876
three circuits which are normally in daily use from Osage can each transfer approximately 50,000 kilowatts. The tie lines between Cahokia and Venice can each, at the same time, handle 50,000 kilowatts or transfer 100,000 kw. between Cahokia and Venice.

Similarly, between Venice and Page Avenue, we can transfer 100,000 kw. at 60 cycles, and in addition to that have a large number of 13,800-volt cables which can transfer about 35,000 or 40,000 kilowatts Ashley to Page at 25 cycles at the same time.

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The net effect of this thing is this, that we can transfer all of the load which we care to transfer. If we were to transfer all the load of one major plant into another major plant area, we would sacrifice the reliability of service because if that connection were to be interrupted for any reason, it would be difficult to pick up that large block of load on any remaining plant.

And consequently, we would, for other reasons, limit the amount of transfer of load from one load area into another

as a matter of system reliability, even if we did have more facilities than we now do. That point has been brought out repeatedly in connection with system reliability and system disasters, that there comes a point at which economy can properly be sacrificed for safety in operation.

On our system, 100,000 kilowatts is, in my opinion, the upper limit at which we should transfer loads between load areas unless we are actually standing by with excessive capacity in each area; in other words, that latter statement
5879 means that there wouldn't be any economy in operating that way, it would be a matter of rather a temporary nature.

The best summary I can make on the thing is that the operation of these lines does result in major economy to our system and that we would have to put them back in again if they were not there.

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Q. Referring to Respondents' Exhibit No. 51, which is the system map, is it or is it not correct to say that power generated at Keokuk could be made available to the service area shown around the Osage hydro-electric project, by means of
5880 a transmission line? A. It could very readily and may do so. Keokuk, although it is 25-cycle generation, delivers its power through 60,000 kilowatts of frequency changers on to the Page Avenue sub-station, 60-cycle bus. The Osage hydro-electric transmission circuits terminate on this bus, so that Keokuk not only could deliver that power out to the Lakeside Light & Power Company, but it wouldn't know it was doing it. The load out there is relatively small.

Q. And the converse might also be true, that power generated at Osage might be made available to the service area in and around Keokuk? A. It not only can, but it is. That

is, at times when we have occasion to supply power to Keokuk, we may take it either from steam generation or from the Osage plant. We must keep in mind at all times in this connection, that Osage is a storage plant and Keokuk a stream-flow plant, and that there may be power available at Osage when there isn't similar power available at Keokuk in excess amount.

The facilities for transferring power are fully adequate. We have anticipated a system of different totals, starting with 500,000 kilowatts peak load, and carrying it on up to 5882
1,000,000 kilowatts for the ultimate future, and the prob-

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ability is that we will not require more than two addition lines to take care of the situation for many years in the future.

One of those will be an additional cable between Page Avenue and Venice, and another may be an additional tie line between Venice and Cahokia, as the Venice plant becomes very greatly increased in the future. And with those two circuits, we feel that we will be able to handle the system load of double its present magnitude, the reason being that 5883
the amount that we would want to transfer from one area to another is roughly limited to 100,000 kilowatts, and we will have that amount available in transmission capacity.

Q. I asked you yesterday if you could state the approximate investment in the Page Avenue sub-station, and you were somewhat in doubt as to the amount. Can you now state the amount of that investment? A. I believe that I hazarded a guess that it would run on the order of magnitude of three and a half to four million. The actual figure is, I

believe, available. The station has a present investment, as of the end of 1939, of four and a half million dollars. It was originally built in 1913 at a cost of $710,000. The modernization of this station, and constant change to keep up with the art and with the requirements of the system, has been very interesting to me, and is really only equalled, in my opinion, by some of the changes that took place at Ashley Street

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where, in the early days, they had steam engines, they re-
5885 moved them and put bigger units on the foundations and then they installed 5,000-kilowatt vertical turbines, and due to the improvement in the art those 5,000-kilowatt turbines were replaced by 12,000-kilowatt turbines in the same space and on the same foundations. Then the big triple expansion cross compound engines, which were the glory of the power industry at the St. Louis World's Fair, were then cut up with a blow torch and removed, and 60,000 kilowatts in turbines were put in, in the place of two of those. I believe they were originally 4,000 kilowatts each, engines, but they were beautiful pieces of machinery.

5886 That Page Avenue job has been analyzed by various engineers as a good example of the changes in the art.

To start with, we had to have a cooling basin for the transformers. Now that basin is as big as two ordinary swimming pools, such as you have at a country club, and cost a lot of money, and they have to pump the water from that basin a distance of about 800 or 900 feet with large pumps and circulate it through all the banks of transformers, and then the water scales up the cooling coils in the transformers, and then the transformers got too hot, and then the coils corroded and leaked, and the transformers failed. Today that

is all done away with, and we have what are known as combination self-cooled and air-blast transformers. These transformers, for example, will have a rating of 37,500 kilowatts,

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self cooled. That means that the radiators are just exposed to the air in the normal manner, with no blast of air directed on them. Then, by turning on blowers, we can increase that capacity to 50,000 k. v. a. This feature, which is a relatively recent application, is particularly applicable for reserve. I 5888
mean, if you have two transformers, or say better three, whose rating is 100 kilowatts each, and whose maximum rating is one-third more than that, then if you have lost one you can turn the blowers on the other two and still get your full rating. It is a relatively cheap form of reserve, and very convenient. Those blowers go on automatically in case the transformer temperature goes above a certain amount.

Q. Will you now describe the practice of the Union Electric Group with respect to maintaining reserve capacity? A. The reserve capacity required for a system is determined by a large combination of circumstances and is not a rigid 5889
thing that can be laid down by some one person and be sure that that decision is the only correct one.

I will illustrate this. If a system has the largest unit, a 25,000-kilowatt turbine, it would not ordinarily require as much reserve as if the largest unit were a 100,000-kilowatt turbine. That is perfectly obvious, because if you lose 100,000 at one time, you would have to have more standby reserve. On the other hand, if you tried to carry a 500,000-kilowatt system peak with 25,000-kilowatt units, you wouldn't

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5890 worry, by that time, about losing one of them; you would have so many of them down for overhaul at one time, due to regular maintenance schedules, that you would finally come back up again and require a large amount of reserve.

So that the answer is this, the amount of reserve required first is a function of the amount of insurance that you feel can be justified against losing any load. Secondly, it is related to the size of the largest unit on the system. Third, it is again related to the number of those large units on the

5891 system. Fourth, it is directly affected by your schedule for overhaul and repair of the large units.

For example, we have a schedule requiring the complete inspection and overhaul of all of our main power turbines once every two years. Now perhaps some people might consider that to be too rigid a schedule, and would be willing to let them go for three years. If you extend your overhaul schedule and inspection to every three years, instead of every two, the probabilities that you will have trouble on your peak load are far greater than if you inspect them every two years. Consequently, if you get three 80,000-kilowatt

5892 turbines, or four, which we have in prospect, on a system, and overhaul every two years, you are going to have two of those down in a given year, and if it takes about five weeks to thoroughly overhaul a 80,000-kw. unit, then you have got 160,000 kw. down during the same year, or you have got

about 10 weeks total in which 80,000 is out of service.

Not only that, but you have got to fit in the overhaul schedule on your remaining smaller units.

To illustrate what we really do, I will use some figures. We have an anticipated winter peak this winter of about 515,000 kw. We have at the present time 630,000 kw. of effective dependable capacity. That would appear, on the face of it, to have only about 115,000 kilowatts of reserve.

In addition to this, we have excess or dump power contracts that permit us to drop that load anytime the water power is low. It is sold at a cheaper rate and available only when the water power is high. So that gives us from 15,000 to 30,000 kilowatts leeway. That load is a variable quantity. 5894
In addition to that, we have another 5,000 kilowatts of 60-cycle reserve contracts, which, on notice, can be dropped in the event we have any trouble on the system. We will add those up, and that gives us an approximate figure today of between 135,000 and 140,000 kilowatts of reserve, over and above the depreciated rating of our plants, that is the 722,000-kilowatt name-plate rating, which we have reduced arbitrarily to 630,000 kilowatts of dependable capacity, and then below that we have from 135,000 to 145,000 kilowatts of reserve, and then our load.

Now we don't consider that we need that much reserve, 5895
but we are willing to agree that 125,000 kilowatts is probably

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as good a figure as we can select at the present time.

If we get three large turbines such as 80,000 kilowatts, then we would raise our reserve requirement to 160,000. So that the water power situation enters heavily into these factors and permits us to take two of these big turbines out for overhaul, always during the spring high water period, and that makes it possible to overhaul the smaller units in the

valley of the fall load, which always occurs in our case after the hot weather.

I want to make clear that where I said that the figure of capacity had been depreciated to 630,000, that refers to our difference between the name-plate rating and the dependable rating.

Q. Now how much of this reserve figure of 125,000 kw. is spinning reserve? A. Spinning reserve is usually taken to mean the amount of equipment in actual operation, over and
5897 above the load requirements. We require that the largest unit on the system be kept spinning at all times, or its equivalent, in our case 75,000 kilowatts. That alone is not sufficient to guarantee continuity of service, but we have got to go further and assure ourselves that we not only have that spinning reserve, but that it is available to all parts of the system, and that no bottle-neck or break may occur and prevent that being delivered to the point at which it is required. That is where our transmission interconnections come into

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5898 play.

(At this point, a discussion was had outside of the record.)

The Witness: The matter of system governing is of great consequence to an electrical system, and becomes more important if interconnections with other companies are made. If a system is operating by itself, good speed regulation is also important, but when it comes to operate with any other system, it becomes imperative that perfect control be made avail-

able. We have a man in our organization who has been interested in governors for the last 15 or 20 years, and has become so proficient in his understanding of these devices that it has become more or less of a hobby with him, and when we were installing the Osage project, we developed some test equipment, and in working with the manufacturer, were able to show that his governors were not all they ought to be, and he recognized that fact and went to work on improve-
ment of design. 5900

The steam-turbine manufacturers have always felt that the utility engineers were always demanding a refinement that was not justified, and that they, the manufacturers, were really building as good equipment as was required. That attitude we thought was unwarranted, and our views were concurred in by others, and a little at a time the attitude of the manufacturers toward governing has completely reversed itself over 12 or 15 years ago.

Permit me to explain that in the early days, out
west for example, where we have the best case in point, 5901

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the most efficient way to operate a hydro plant is to do what they call set it on the block, fix it to operate at the load for which it was designed, and let it stay there. Now, there is the most efficient way; you get the most out of that water wheel. But unfortunately, someone has got to govern the system somewhere. Whenever you govern a system you have to take the load fluctuations on that machine. Suppose that in

our case we had a 500,000-kilowatt system load, and that in order to govern that load and keep the load constant on all machines but one, we try to govern the whole system with one machine. That machine would take a constant variation from 30,000 to 50,000 kilowatts, just varying every second, and it would be too hard on the machine. That was attempted and very sensitive governors were put on one or two turbines, and failed because the variations in the load on those
5903 turbines were too rapid and too extensive, and they were removed, and the manufacturer said: "I told you so; you don't need these sensitive governors." Well, the trouble was that we did not have them on a big enough percentage of the whole system. If we could get sensitive governors on every wheel or turbine on a system, when the load goes off at noon, everybody quits, and the load drops for an hour suddenly,—if every turbine generator on the system were to vary in the same percentage, let's assume a 10 per cent. drop in system load or 50,000 kilowatts—if every machine
5904 on the system were to divide that drop in load in pro-

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portion to its size, the size of the machine, a 5,000-kilowatt machine would only drop 500, a 7,500-kilowatt machine would only drop 750, and all the machines on the system would still be operating very close to their economical point. On the other hand, if you drop that sudden change in load on one or two machines, it would either overload the turbines so that they could not be operated, or they would go

down to such light loads that they are inefficient and may even get to the point where they cause trouble by over-heating. A large turbine will not run at no load, it will over-heat due to the way the steam operates, and may burn out blading.

Now then, the result of this is that Mr. Davis, the name of this gentleman, has prepared a number of papers, and one a rather comprehensive one, only last year. All of these things have taken place together. We have shown our problems, other companies have 5906
shown theirs. The manufacturers are now all in agreement in developing some very sensitive governors, and we are getting one of the very latest on these new turbines at Venice.

In fact, we have gone a step farther and are providing those turbines with dual governors, one of normal sensitivity and one a small head of super-sensitive design. The results of good governing have been checked on our system enough to show that there is actual economy in the use of fuel by not having the

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load constantly fluctuate away from the efficient point of the machine, and that money can really be saved by keeping the frequency where it should be.

Now I believe that I am very modest in saying that our company, through the efforts of this gentleman, has contributed a fair share in the development of this improved governor. We wrote specifications for governors three years ago, and were unable to obtain them; had to give it up. This year we went back with those same specifications in principle and

are successful in obtaining them. Not only could they be obtained from one manufacturer, but we could have obtained them from all three of the big turbine builders. That, in itself, will permit better operation on these large systems, and better service to the public with lesser cost..

Q. Now will you state whether it is the practice of the Union Electric Group to provide additional generating
5909 capacity in advance of actual need? A. Well, let us answer that question in this manner. We never spend money to get turbines to carry load because we are always carrying the load; we spend our money to obtain turbines to take the place of the reduction in reserve. Consequently, if we keep the reserve at least 125,000 kilowatts in advance of the load, we have to keep adding the turbines to keep up with the procession. The difficulty arises in the amount of time required to obtain the equipment and build a plant. I would like to illustrate that. In 1937 we had an unusual

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5910 rapid rate of growth, load growth, during the year, up to the 13th of August, whereupon, not only on our system but throughout the country there was a sudden drop in load, and we lost about 100,000 kilowatts within the next three months, below that peak.

Now, just before that peak, if you had taken into account the rate of load growth, you would have anticipated that you should have purchased and installed within a reasonable length of time another 80,000-kilowatt unit. It takes a minimum, under normal conditions, of 18 months to get

one of these units and get it installed, and under the conditions, as they exist today, we are being told that if we want to get capacity in operation for the winter of 1942, or possibly the spring of 1943, that the order must be placed within a matter of the next two or three months at the latest.

Now then, you see my point, that we are unable to state definitely that the load will be here and that we will need the turbine, and yet we cannot afford to assume that it won't be required, and hence we have to place orders for this machine, firm orders, and pay for it, without any pro- 5912
tection as to what the business conditions may be, and it requires considerable courage on the part of utility companies to make those huge investments. These units at Venice, this first section is estimated to cost $11,500,000. That is usually high because there are a lot of other things to be done, and that cost will get less later, unit cost, as the

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plant is expanded.

But nevertheless we have to make these investments and commitments two years ahead of what we know may be required, and yet that is demanded as a matter of protection 5913
to the public in the event that they need the power.

The Examiner: Let us take a recess of five minutes.

(Whereupon, a short recess is taken, after which the hearing is resumed.)

The Examiner: The hearing will resume.

By Mr. Hamilton:

Q. I believe you stated the anticipated peak load for 1940. Will you state now the peak load actually experi-

enced for 1939 and 1940? A. The 1939 winter peak was 478,000 kilowatts on December 12th. This season's summer peak, July 9th, was 491,050 kilowatts.

By relating the winter peak to previous winter peaks, and by relating this summer peak of 491,000 to previous summer peaks, we conclude that the probable winter peak for this winter will be between 515,000 and 520,000. We state it as 515,000.

Because I may some of the time refer to a load estimate
5915 with a winter peak for this winter estimated at 500,000 kilowatts, I want to again state clearly the distinction between the two figures which appear to be different and applies to the same thing.

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In the operation of our power plant equipment, and in the calculation of the reserve, this 125,000-kilowatt figure which we have been using, this reserve, is based on the assumption that no dump-power load or 60-cycle reserve load will be carried unless we want to. That is the basis of those contracts. Consequently, our winter peak for this
5916 winter includes both the excess for dump power and these other contracts. The possible rate of growth for the next two years is one of the most difficult things to predict that we have ever had.

In the years from 1911 on, for many years we were able to predict the load with a degree of accuracy, but right at this moment we have one inquiry for a 20,000-kilowatt possible single load; another inquiry for a Government application of 20,000 kilowatts; and actual increase already agreed upon in an aircraft plant but the amount of the load

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is variously estimated as being from 5,000 to 10,000, or maybe twice that amount, kilowatts. In other words, the rate of change is rapid in this National Defense program, and no one knows just what is going to be done.

Consequently, we have to play a little more safer for the next two years than would ordinarily be the case, and whereas, as I have stated previously, we have a building construction program planned on a 10 per cent. per annum rate for the two years——

Q. (Interposing) That is rate of increase in load? A. 5918

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Yes, rate of increase per year. —Carried on for only two years, we know that that can not keep up for ever; but we really confidently expect that the actual load on that equipment will not exceed 8½ per cent. growth per year compounded each year over the preceding year.

Now what I mean is that because of the magnitude of single loads which may be conceivably dropped onto our system without warning, that we have got to have a little more latitude for the next couple of years than is ordinarily 5919
required. We simply cannot estimate load growth with accuracy.

Q. Now in order to get an idea of the relative contributions of each of these generating plants to your total group output, are you able to state for the year 1939 the gross generation in kilowatt hours of each of the generating stations you have referred to? A. Yes, I can state the gross generation of each of the stations.

Osage hydro-electric plant—235,850,700 k. w. h.—all these figures are in kilowatt hours; Keokuk—756,662,500; that

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making a combined total for the hydro system of 992,513,200. The steam system: Ashley Street generated 14,003,025; Rivermines—nothing—(this is for the year ending 12-31-39, I believe that has been made clear)—Cahokia—1,553,376,-000; Venice—39,331,000; Cupples—296,930. Total steam—1,587,006,955.

Q. Now, if you will, the net generation, giving the figure —2,552—

5921 not by plants but as an aggregate figure, if you can? A. The net generation represents the difference between the gross generation and the amount used by house turbines and house auxiliaries and other equipment in the plant. The net generation in total for the hydro was 979,643,130; steam net generation—1,488,752,501.

Q. Now will you relate the occurrence of the system peak load in 1939 to the demand imposed by that load on the individual stations? A. The distribution of the 1939 peak, which occurred at 5 p. m. on the 12th of December, was: Osage plant—45,000 kilowatts; Keokuk—86,000; Ashley Street—

5922 20,000; Rivermines — Zero; Cahokia — 293,000; Venice — 32,000; Cupples—zero.

The combined distribution was 131,000 on hydro and 345,000 on steam, making a combined total peak of 476,000.

I should have given you the combined total of net generation as just previously. That figure was 2,468,395,631 kilowatt hours.

I think that it is clear that these last figures on peak demand have been kilowatts, which is the rate at which the power is being taken.

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Q. Now are the steam cycles employed in the generating stations of the Union Electric Group consistent with the cost of fuel to that group? A. The answer to your question is "yes", but without a little further explanation that may

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not be entirely sufficient.

You will observe, from the figures just given on generation, that out of a total of 2,579,000,000 kilowatt hours, 992,000,000 were generated by hydro. Now this was not a 5924
particularly good hydro year, in fact it was just the opposite for the Osage plant. The drainage area for the Osage plant lies out in Kansas and west. The rainfall in that area was much below normal. So that the normal generation by hydro would have been about the figure given here for Keokuk or slightly above, but Osage should have produced 400,000,000 or over. The result is that if I were to correct those figures for what might be termed a more normal year, you would have had at least 1,000,000,0000 or something above that generated by hydro, and a billion and a half, possibly, generated by steam. 5925

Thus it can be seen that the load factor on our steam system, the hours use per year of the capacity, is much lower than would be the case in a city which is supplied solely from steam plants. In other words, you have to always keep that in mind on every one of our operations and our designs. For example, as I have stated earlier, the annual load factor on some of the Ashley Street equipment which is used for 25-cycle reserve for Keokuk, is extremely low, in some years below 5 per cent. Obviously, on equipment used for such purposes, the total annual cost is almost entirely fixed

charges on the investment, and the operating expenses are very slight, and the efficiency in operation is of little con-
—2,554—
sequence.

What we want for that purpose is equipment which can be started quickly and which will operate reliably. Reliability, quick starting and low annual fixed charges are the ideal requirements for reserve equipment for hydro.

Now for a high load factor steam plant, maximum
5927 economy, with reasonable investment and reliability are the requirements. In other words, they are radically different.

Consequently, in diluting our total system kilowatt hours with the hydro production, we have a decided effect on the operation of the steam plants.

Stated another way, we could not afford to spend as much money for the most efficient steam cycles because they do cost more, as we could afford to spend if we were operating a straight steam system.

For example, Keokuk, which only once in 80 years of rain-
5928 fall record would have gone below about 65 or 70,000 kilowatts supplied constantly every hour of the day, every day of the year, right on our base load. If we didn't have that energy we could, in the place of it, purchase and operate the most efficient steam turbine of 60 or 70,000 kilowatt capacity which we could acquire, with one exception, that we have a reasonably priced coal readily available. If we were to have high price coal, such as occurs in New York and New England, roughly speaking 16 cents per million B. t. u., as
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compared with 11 to 12 cents in St. Louis, we could justify

further refinements. The result is that we have to consider the steam cycle as applied to St. Louis, taking into account our cost of coal and the application of our hydro plants, and determine the best cycle for use regardless of what somebody may do in some other location under different conditions. We have concluded that our best steam cycle for the new Venice plant is 850-pound-900-degree equipment, but we recognize that if we were to suddenly put in twice as much equipment at Venice immediately as we are contemplating, we could not give the next two units that high load factor, 5930
and it would not be economical to do so.

Does that answer your question?

What I want to make clear on my own account here is that I am not criticizing nor advocating any particular steam pressure or temperature, for conditions that justify 1,250 pounds, 925 degree units, that is all right. Mr. Ford put in such a plant. He runs it at the maximum capacity 24 hours a day. One of our own system companies has such a plant. Their coal is much more costly than ours.

In our case we have calculated all of the different pressures and temperatures, and have selected the one which, 5931
in our opinion and with the advice of our associated engineers in our system of companies, will work out the best for us.

Q. In terms of economical operation? A. In terms of

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annual overall minimum costs, including all costs.

Q. Will you state what factors have entered into the selection of the generating station sites which you now have in use? A. The selection of a site for a generating station

is a very important engineering and economic decision. Much has been written about putting steam plants at the mouth of coal mines. It is actually a fact that at Pittsburgh, at the junction of the two rivers in the city, they have some plants which are located on adequate water supply and which are very close to the coal mines. But in most cases the mouth-of-mine plant has been the dream of authors who had very little to do with the power business. There are very few mines in the world that are located where adequate
5933 condenser water would be available to run a plant of any size whatever.

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The offsetting factor, even in those applications where you do have both the coal mine and the load and the water all at the same place, there, in order to protect youreself, you usually have to acquire a control or actual ownership of such a large acreage of coal land, looking to the future, that your fixed charges in the early years are frequently discouraging, and even then you may not have guaranteed yourself a supply any better than the person who simply is in position to con-
5934 tract with any coal district in the country that is in position to furnish the required amount.

In the St. Louis district, we have a choice of two coals, one located near the city with a relatively low heat content, and a rather low cost. To be exact, the heat content runs around 10,000, or a little over, B. t. u. per pound, and the cost delivered to the plant would be in the general range of 9.3 to 9.5 cents per million B. t. u.

Or, we can burn a higher grade of coal, which comes from Franklin County, Illinois, lying to the southeast, a distance of roughly 100 miles, and that coal has a much higher B. t. u.

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content, something under 11,000, a lower sulphur content and in every respect better suited for power plant operation. We prefer to burn the better grade coal, and have not been able, so far, to completely successfully burn the low-grade coal without reducing the ratings of our boilers. If we reduce the ratings and get less out of them, then we have to have more

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boilers and that increases the investment charges. So when the thing is carefully analyzed over a period of years, so far our conclusions are that the burning of the better fuel is 5936
preferable. That means, then, that we must have railroad facilities from our proposed plant site to these Franklin County or Southern Illinois fields, but under no condition would we want to locate the plant so that the low-grade coal might not be conveniently available. The reason for that is that these coal rates and freight rates and arbitrary charges are being changed year by year At the present time you have what is known as the Guffey Bill, which fixes the price at the mine.

Suppose they were to change that next year, we might have to change and use a low-grade coal. So, looking many 5937
years in advance, we must protect ourselves with good transportation facilities between the coal field that we are using, and those we may have to use, and the plant. We must also observe switching charges, because, under certain locations which are otherwise very favorable, the local conditions might add from one to two dollars per car for switching charges.

Now we next have to look at the water supply, and that is convenient in the St. Louis district anywhere up and down

the Mississippi River, but foundation conditions and available land are not so convenient. The thing has become so well occupied and so much demand for river front sites right close to the city has gone up, and so much question as to

what constitutes the river and where the boundary of it is, that there was an act of Congress passed to fix what are known as harbor lines, and those lines have been designated, and you can build up to a certain line called the harbor line.

5939 Now then, at Cahokia, the site finally picked after considering all of these factors, was selected containing 56 acres, and even back 16 or so years ago, we had to pay, I believe, better than $5,000 an acre for those 56 acres, and a good part of them had to be filled and brought out to the harbor line.

Today we have this site at Venice, which will accommodate a 400,000 kilowatt plant, but I wouldn't know exactly where to get another close, convenient site. Our next move would force us to go north up the river, and increase our transmission or distribution costs to get a favorable site.

5940 We have this disadvantage that foundation conditions on the river are very severe, and in addition to that we have to design a plant to take a variation of at least 36 foot in head of water. The river may, at extreme low water conditions, be here (indicating), and at extremely high water, may be possibly 36 feet higher. You can compare that with a lake plant where there is practically no variation in head.

But we have the added advantage that we are right at our load and the cables coming directly from the plant to our various city sub-stations without any intervening transmission investment, or liability.

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I could go a little further and describe the hydro plant location, but after all, that is pretty well understood by everyone, that you have to locate a hydro plant where a dam can be constructed on a river, and where overflow facilities can be had.

For example, in the case of the Osage project, we had to move one or two towns, and a railroad, and something over 2,000 cemeteries, and I don't know just what else—a great many things—to get the basin, where the storage was going to be, cleared. There are very few places in the Middle 5942
West where you can afford to overflow land these days, that is, the investment is so high that it would render the project relatively unattractive if you had to do too much of that.

We were contemplating raising the head of the Osage project another 5 or 10 feet, and we found that to do so would flood out one major railroad, and would tremendously increase the investment, with more than the gain to be obtained. We did raise the height 5 feet above the original contemplated figure, and found that that was advantageous.

Q. Isn't there a rather heavy load on the Illinois side
of the Mississippi River, as well as in St. Louis? A. At 5943
the present time the load flowing out of the Cahokia plant itself is about equally divided at times of peak, about half to the Missouri side and half to the Illinois. The difference

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in the characteristics of the load are rather noticeable; the Illinois load has its peak at a slightly different time than the Missouri, city load, and the Illinois service is supplied over a smaller number of high voltage circuits, whereas the city load is supplied over a large number of submarine

cables at 33,000 volts, going direct to our distribution sub-stations, which we will describe later.

Q. And the central location of these stations results in savings in transmission costs, and in reduction of transmission losses, isn't that correct? A. Yes. People rarely realize the actual cost of electrical connections. I have always had a good deal of amusement out of a little selection we made at one time, on a relatively small scale. We bought a lot down in the city, and decided to locate the
5945 downtown sub-station on the back end of the lot, and rent the front of the lot for business purposes. It sounds logical.

We did that, but after several years' experience, I made a calculation and it showed that the fixed charges on the cable connections to run that 60 feet from the back of the lot to the front, were at least equal or greater than the rent obtained from the front facilities. In other words, all our worry about getting the store in front was really offset by just a few feet of very heavy cable connections.

I use that to illustrate the point that every foot you

5946 move a power plant away from the city runs into money.

I had occasion to make a calculation recently in which there were four 66 kv. cables required to carry the load. Those cost, roughly, including conduits, about $15 a foot each, or $60 a foot for the four. If you multiply that in round figures by 5,000, you would have $300,000 a mile, so if you were to move your plant away from the load one mile, and had to supply it with these four cables, it would cost you about that amount of money, and if you did it at a lower voltage, it would cost you more than that. So that

that brings out the advantage of a site immediately adjacent to the large load.

Q. Are the same favorable conditions applicable to the location of the Ashley Street plant? A. Ashley Street plant itself is located almost out in the river, and we have been repeatedly told by the War Department, who have control of the channel in the river, that we ought to enjoy that plant because we will never again get a chance to put one out there like that. In other words, it is of great advantage to us, although not much to the liking of the War Department 5948
engineers whose job it is to maintain a straight channel up and down the river. And the old Ashley Street plant, and several other concerns at that location, were permitted in the early days to establish themselves farther out in the river that they will let you do now. That is decidedly ad-

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vantageous to us from the standpoint of condensing water. Cahokia is pretty well located, but it had to be put back farther on the shore than the Ashley Street. Ashley Street station is within a very short distance of the major down-town load. 5949

When I come to a little description of the downtown distribution system, I would like to digress there a little and describe the density of our load, and its small area, but high density as compared with New York City, for example. And Ashley Street is located very close to that dense section.

Ashley Street, also, supplying our steam-heating requirements, would have to have some such location. You can transmit electricity over a considerable distance, but you cannot transmit steam an unlimited distance, and if Ashley

Street were not located the way it is, we probably would have to have a duplicated steam-heating station, and a separate power generating station. By that I mean, the particular location there permits a joint operation which would not be practical otherwise.

I would like to make one other statement here. We need Ashley Street for electrical reserve, we must have it for steam heating, and the two work in well together. But, if we weren't permitted to have a location down there near
5951 the city, we would have to have a separate steam-heating plant which, if located out west farther and closer to the center of load, would have to buy city water, which is ex-

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pensive, and we would have to make a corresponding addition to some other electric plant. So that we are constantly confronted with the value to our system of the Ashley Street station, and if it ever wears out, we will have to try to replace it again in the same site, if we are permitted to do so, and I think we will be able to do so.

But in order to protect our interest, and to be sure that
5952 the Ashley Street station is in no way a disadvantage to the community, we have cooperated with the local group there recently in a smoke elimination campaign, and are just completing a Cottrell plant, which is an electrical precipitation device, and that is going to be tested within the next fifteen days. My own little engineering group made the layout for the equipment, and it is the only known way so far of completely eliminating the finer particles of smoke.

Q. Now are switching and step-up transformer stations provided at each plant site? A. They are. St. Louis is one

of the few places which concentrates to a large extent on operating with what we call individual transformers and lines.

For example, out of Cahokia we go out from the main bus at 13,800 volts, put an individual 12,000 kw. transformer on a single 33,000 volt cable, go an average distance of approximately 5 miles, step down through another 33,000 volt trans-

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former, to a 4,000 volt sub-station, at which point we have an oil switch on the 4,000 volt side. 5954

The result is that the transformer, the cable and the second transformer are all treated as units. We don't do any high voltage switching, and that circuit then is duplicated form some other bus section in the plant, to this sub-station.

The result is that we have a simplicity of arrangement and a safety in operation and convenience that is hardly possible by other methods, and we feel that the added investment in the transformers is to a large extent offset by the saving in oil switches, and that the net result is more reliable.

Now in addition to the transformer step-up and switching station which goes with each power plant, we have some bulk 5955 power step-up stations at Cahokia, and the other plants, where we do have the other method used, namely, high voltage outdoor oil switches and conventional design of steel structure.

Now the figures which I gave you for plant investment do not include any of the equipment which I am now describing.

At Osage, the plant is operated at generator voltage, 13,800 volts, and stepped up immediately to 138,000, with

no high tension breakers at either end of the line; in other words, we follow the same principle at 138,000 volts that we do at the lower voltage. That line comes on into Page Avenue and steps down, and switching is done at 13,000 volts on each end, no high voltage switching.

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I should go a little further and describe the fact that we have provided a double bus at Keokuk, and by a double
5957 bus I mean just about twice the investment for a single bus, that is, each typical feeder out of the plant can be supplied from either one of two buses, instead of from one only, which is very frequently done, and permits any bus to have the voltage removed for cleaning and repair work, and permits immediate transfer of a feeder, if anything should go wrong with a bus, and in every respect it is highly desirable except that it is a little expensive.

Our conclusion is that rather than attempt to reduce the cost of equipment itself, which means reduce the quality, that our best road to future economy is to concentrate on carry-
5958 ing more power per unit; in other words, if an oil switch costs roughly $35,000 installed, including its position, at Cahokia, or at the new Venice plant, which it does, the more kilowatts you take out through that switch, the less the unit cost per kilowatt, and we have decided to give continuous attention to keeping the ratings and actual use of the equipment as high as we can; in other words, keep it loaded to capacity, and thereby try to keep the investment within reason, because this equipment is consistently increasing in cost each year.

I always like to make the point that every time you spend $35,000 for an oil switch in position, you are spending real

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money to open the circuit and eliminate the revenue, cut the customer off, or something, at least they don't bring in any revenue and they are a necessity. But we have so far not been able to eliminate them, and offer any substitute. We are strongly interested in the new air-circuit-breaker equipment which is now being offered, and have purchased two sub-stations with the new type of equipment. We will watch 5960
with interest the tests which are going to be made this coming month for some breakers which have been ordered by the Consolidated Company—it happened they were the first ones to order them—and no one knows just how they will perform, but they are a new development in air circuit breakers to take the place of oil circuit breakers. Those that we have purchased have worked very well indeed, but they were at smaller ratings.

Q. Now will you describe the design of the switch-house at the Cahokia plant? A. The Cahokia switch-house has been changed in design somewhat from its original inception. 5961
Originally, it was a straight, double-bus arrangement, with what are known as selector oil switches, so that any turbine or any feeder can be put on either bus by the operation of oil switches under the control of the operator at the board.

We wanted to purchase a 75,000 kilowatt, two-winding machine; having already purchased one a few years ago, and

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having gotten good results from it, we wanted to use another one, and it was difficult to locate that two-winding machine suitable in that particular bus arrangement.

5962 So we, by making very slight physical changes, changed it into a ring bus, in which each of the two double buses furnish the two sides of the ring, and the ends were closed through these double-winding 75,000 kilowatt machines. That made a very satisfactory arrangement. The individual machines in between those two, which covered the two ends of the plant, are single-winding machines. The result is that we have eliminated, by that means, an inherent difficulty which can arise in the operation of large, two-winding ma-
5963 chines, if they are located adjacent to each other down a bus.

I should explain here that a two-winding machine is simply a large generator in which there are two independent, parallel windings, each of half capacity, instead of one customary winding of full capacity, the reason being that the short-circuit problem involved with those large machines in a single-winding, is very severe; and at the time we bought the first one, switches were not available to handle it, and even today we wouldn't want to pay the price if they could be had.

So the two-winding machine is a means of keeping down
5964 the short-circuits, and also provides a means of obtaining a little over half the capacity of the machine, even though a part of the other winding might be in difficulty.

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Now it would be presently characterized as a ring bus design of 12 sections, terminated at each end of the plant or made continuous through these two-winding machines. That type of bus is very satisfactory up to a certain limit. We think that Cahokia station has now reached that limit, and we do not advocate that particular design if we wanted to

push it above two such machines, that is, above the 300,000 limit. The new Venice plant is being designed so that it can go to 400,000.

Keep in mind that I am not advocating a 400,000 kilowatt plant just because we like a big one, and we may never build it to that extent, but there are conditions there with regard to the river, sites and other factors, which may make it desirable.

The result is that we do not want to do anything today in the electrical design which will preclude such possibility. 5966

With that in mind, we have designed a different type of bus, known as a synchronizing bus, a transfer bus, and a third bus which carries the generator and the feeders. This is not a new idea, but in the application of it we are adopting some rather new arrangements. This is not a cheap arrangement, it is probably a little more expensive than the Cahokia scheme, but it does provide for independent control of what we call our kilowatt load as distinct from the control of the reactive or kilovar load. One of those is the part of the power

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that is used for magnetizing the fields of all of the equipment, 5967
such as motors, and so on, and which is generally spoken of by electrical engineers as being at right angles to the main power. I will explain that a little more in detail to this extent, that at unity power factor you can put considerable load through what is known as a reactor, a choke coil, which is inserted in the bus or system to keep the short-circuits within bounds. You can put considerable load through that choke coil at unity power factor with very little voltage drop.

If, however, you attempt to put low power factor load through that choke coil, you get an excessive voltage drop.

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Consequently, in operating a large system where we have to shift the reactive power around a system to control voltage, and have to deal with it in every respect as carefully as we do our kilowatt power, we must have provision for full voltage control, and by connecting our tie-lines to this synchronizing bus, we can transfer, we will say, a 60 per cent. power factor load, of 50,000 kilowatts, into the plant, let the kilowatt component flow through the synchronizing bus, and the reactive component go to the transfer bus or
5969 the turbine itself, and each turbine then can give us voltage control and thereby get satisfactory operation from the plant, and not have a lot of limitations which cause a plant to operate at less efficiency, from the standpoint of investment, than it should.

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Many plants are built, and look to be all right, but you never can do everything with them at one time that you should be able to. This is an attempt on the part of the electrical design to see to it that no limitations will exist from day to day that will reduce the effectiveness of that
5970 investment. It is a joint endeavor on our part and that of the Stone & Webster Engineer Corporation. Both of the engineers, myself and their engineer, have worked quite a while on this thing, and we have great hopes for its success; in fact, we know it will be all right.

That is about all, I believe, that I would care to say on the Cahokia switch-house.

I would like to point out that in these modern big systems, that it does cost a lot of money to connect a feeder to a big, high-powered plant. We use, for round figures,

$75,000 as the cost of taking a feeder out of Cahokia, and that means that you have got to take some load out on that feeder or you are going to have a lot of investment tied up.

So we are gradually stepping up our sights as to the amount of load that we can take out on any one feeder, and our ultimate goal would be a plant where every feeder took 50,000 kilowatts out of the main plant, and then we would break those out up some other point into some lower voltage delivery.

Q. Now is pulverized fuel in use in your steam plants? 5972

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A. Yes, it is in use in all of our major plants, both Ashley Street and Cahokia, and will be used in all future plants. It is very successful. We have two systems in operation at present, one known as the storage system, in which the coal is pulverized and delivered into a bin, and from there delivered to the boilers; the other system is known as the unit pulverizer, which provides a separate grinding device and delivery to each boiler. We ourselves prefer the latter, and our new plant is being so equipped.

Q. How about the existing plants at Venice and Rivermines? A. They are stoker plants with the exception of the new boilers at Venice, and they are pulverized fuel boilers. The old ones are stoker. I think it is a safe guess to say that 95 per cent. of our power output in kilowatt hours here, from steam production, is probably made from the pulverized fuel. The pulverized fuel operation is becoming so perfect and so satisfactory that in our new plant we are considering a design in which there is no partition wall between the boiler room and the turbine room, just columns. That seems 5973

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like rather an unusual arrangement, but there seems to be no reason for not having it.

Q. Is auxiliary equipment duplicated in the design of the new station? A. Well, it is duplicated, and even a little more than that in our present Cahokia station, but in the new sta-

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tion we are making provision to try to take care of those things which have happened and influence the reliability of power supply.

5975 As these boilers get larger and larger, and the pressure higher, it is more important that the boiler feed pumps not stop. It is a matter of seconds in some types of design from the time they stop until the boiler goes up, and in our case it might be a matter of minutes.

So we are providing five boiler feed pumps for two boilers. That is, each boiler has a pair, and then there is a spare for the group, and those boiler feed pumps are a mixture of electric and steam, which is advantageous for heat balance control.

The new plant at Venice will have a big concrete intake
5976 caisson down to bed rock in the river, and that caisson will be divided into two halves, and each half will be divided into two pumps. It sounds like the "House that Jack Built". The individual pumps can carry the first two sections of the station, that is, in other words, we have to first guard against any trouble with screens or water supply which might throw one-half of that caisson out of commission. We certainly have got to be sure that the other half will carry the plant.

Then, if the other half is carrying the plant, and if such a condition as that should occur, that half of the caisson

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could readily be out of service for some time, because if something were to break or fail, or the traveling screens were to get jammed, or some work required under water, we might have to shut down one-half of that caisson to get a diver down there to do the work.

With that in mind, the pumps in the other half should be able to take care of the plant, and it is so designed. At the present time, all of those pumps are not being installed because the capacity of the plant is not up to the full rating,
but the same ratio is being maintained. That is about the 5978
most extensive triplication we have done, but it is most vital to the plant. That supplies the condenser water to all the turbines.

Q. Now, why are these duplicate facilities provided? A. Well, the idea is to maintain continuous service, and everything that you can do with that in mind, without wasting money, is in the direction of the best operation.

Frequently we make this kind of a calculation—assuming that we are in business to supply the best possible service, and still knowing that 100 per cent. service, if there were
such a measure, can never be supplied, or if it could it 5979
would be at such fabulous prices that nobody could afford to buy it, the question that has to be finally worked out is—what grade of service can be supplied from a plant or a utility to the public, which is most feasible and most

desirable by both? It wouldn't be 100 per cent., and it certainly wouldn't be 70 per cent. It might be 85, and it might be something up in that range, but as you approach perfection, you increase costs out of all proportion to the gain

5980 *Stanley Stokes—By Respondents—Direct*

made, and if you finally insisted on having a system on which there could never be any interruption, there couldn't anybody afford to buy the power.

Now with those things in mind, we tried to design equipment which is within reason as to cost, and which will deliver such highly reliable service that any attempts to improve it beyond that point would be regarded as wasteful.

Now that again is a function of how big the plant is, what happens if it is lost, and a great many factors. In a
5981 very small plant where we can lose the whole plant without affecting service, we wouldn't worry about it. But when you contemplate these major systems for metropolitan service, the cost of an interruption, or value of it, is so great that these things become justified which heretofore have not really been contemplated, and if they increase the cost of your whole development by possibly one or two per cent. over and above what might be considered regular, and if that 2 per cent. can be shown to be advantageous, both to yourself and to the public, we think that where it is about an even break, that it ought to be put in rather than saying that where it is
5982 about an even break that it ought to be omitted. If we

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become very poor some day, we will have to change our views a little bit, but as long as we can really get the money and put these things in, we think that it is good business to do it.

Now that again is a matter of engineering judgment, because it isn't a thing that anybody can lay down exact rules and regulations to cover We want to get good service, the best that can be had, but we must also keep in mind that perfect service would be unapproachable, and too expensive to use.

Those bases of reasoning have a very wide application and a bearing on the type of plants, and when somebody says to me, "Why does your plant cost a little more than my plant?", I say, "Well, we were very careful in putting it in, we didn't waste any money, our man-hours on the installation are reasonable, and the only reason is that there is more in the plant, more equipment there."

We could omit some of it, but we would have to put it in some other place in the system, or would have to have some other form of duplication, or would have to build some other kind of a plant to make up for it if this were out, and on the whole I think the duplication of auxiliaries in a main steam plant is absolutely justified. 5984

The Examiner: We will recess until 2 o'clock.

(Whereupon, at 12.30 o'clock p. m., a recess was taken until 2 o'clock p. m., of the same day.)

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AFTERNOON SESSION

2:10 p. m.

The Examiner: Let us resume.

Whereupon, STANLEY STOKES, the witness on the stand at the time of recess, resumed the stand, was examined and testified as follows:

5987 *Direct Examination by Mr. Hamilton (Continued)*:

Q. Mr. Stokes, this morning you referred briefly to the steps the Union Electric group has taken in the direction of reducing fly ash pollution. Will you explain those steps in more detail and, also, state the significance the problem represents? A. First, if I may, I would like to describe a situation with which St. Louis is confronted. The coal which is available for residential use at low prices is of high volatile content and does make smoke and ash. The poorer classes in the community can not afford to burn the higher-priced coal and even the next higher-priced grade of Southern
5988 Illinois coal is, also, a highly volatile coal and makes a lot of smoke. It is very difficult to fire it in hand-fired furnaces or stoves.

The smoke problem in St. Louis has become more pronounced in recent years and at periods of low wind velocity we have quite a considerable difficulty.

The civic groups have recently taken the matter up and

have succeeded in passing ordinances for certain smoke prevention rules and regulations and are insisting on stoker-

fired equipment in commercial establishments but, as a result of carefully made surveys, they find that the large percentage of the smoke is made by the small, independent user and that something like 37 per cent. of all of the coal-burning applications in the city proper are still the old fashioned stoves in the poorer districts.

It, thus, becomes somewhat of a social problem to take care of. You can not insist that people pay more for fuel than they can afford to. At the same time, the smoke that
they make is detrimental to the interests of others, but dur- 5990
ing the period in which this effort is being made to eliminate smoke in so far as possible the utility who burns the greatest amount of fuel in the district is naturally involved. We do not make much smoke, as such, but we do burn lots of fuel and some of it goes off, out of the stacks, in the form of fine, light gray ash.

To cooperate with the civic movement we have recently agreed to provide the latest known form of equipment to eliminate smoke from our plants. The first application of this equipment is at our Ashley Street Station where new
boilers are being installed and being equipped with what is 5991
known as Cotrell precipitators. These are electrical devices for collecting the particles of ash and carbon that form smoke.

This type of equipment comes in many forms, but the particular one we are putting in is known as a plate type precipitator and consists of a series of grounded plates, meaning

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that these plates are connected to earth electrically, and in between the plates are suspended fine wires which are charged

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to a relatively high voltage direct current. The gases which leave the boiler pass by these wires and between the plates and the gas becomes what is known as ionized as a result of collision between the electrons that are being sent out from the highly charged wire and the gas molecule.

The gas molecule then becomes charged, itself, and is attracted to the grounded plates. Once the particle reaches the plates it loses its charge and there is no longer any attraction but it has a tendency to stick there unless something
5993 thing dislodges it. The result is that the smoke comes in at the bottom of this thing and it is repelled by these wires and the particles stick on the plates.

At some convenient interval this material is removed or otherwise driven down into hoppers and carried off in conveyors and into a storage tank or a loading or sacking device where the stuff can be put in sacks.

At the present time there is not enough market for this material for us to justify sacking it and we will have to dispose of it. We are not permitted to pump it out on the river because it will float. These particles are so fine that they,
5994 themselves, are not readily wetted and you can't get them to sink, so that they would float down the river for some miles.

—2,580—

That means that we would have to acquire a joint property and have some form of pit where we could pump this stuff in and let it settle.

Some day we hope to acquire enough demand for the material to make its sale at least enough to warrant its shipping. It is now used in small quantities in cement manu-

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facture to make the cement harder or to waterproof cement.

The cost of this particular equipment for the two boilers at Ashley Street is in the order of $60,000 but we will later have to equip more boilers and that will increase the cost. At Cahokia, which is our large steam plant on the East side of the river, we are trying out the first section with an experimental installation. It is estimated that the precipitators for the complete plant may run in the order of $1,000,000, as the quantities of gas to be handled are very large and there is not room on the roof to install the equipment and there is 5996 some question about the weight of that much equipment being added on to the existing structure, so that we are actually building what is equivalent to a small new building alongside, carrying the gases out into it and down and back up into the stack and out.

This first section is under construction. My department is now laying out the details of the electrical part of the equipment. In order to obtain this high voltage direct current you use some form of rectifier. You start with alternating currents and transform it up to high voltage and either by vacuum tube or mechanical rectifier transform it 5997 into direct current.

The quantity of ash that is collected in this manner is very considerable. Illinois coal runs from 14 to 15 per cent. ash and a certain percentage of that, which I can't state exactly, is carried up the stack in the form of smoke.

The community, I think, is well pleased with our cooperation. It isn't one of those things that we benefit from directly. It does cost us money and it doesn't contribute

anything to producing power, but it is a benefit to the community.

Q. The program is a voluntary one, is it? A. It was offered voluntarily by the President of our Company without any attempt to protest the expense or any other strings tied to the proposal. The city has accepted our proposal and we have stated that we have to have some time in which to work out the Cahokia job and are engaged now on the first section.

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Q. To indicate the significance of the problem, can you state, if you know, how atmospheric pollution due to smoke in St. Louis compares with, let's say, Pittsburgh and some other city? A. Well, I don't particularly like to advertise my own town as a smoky city, but I believe the facts are that Pittsburgh, which originally had the honor, carried on quite a comprehensive smoke-elimination campaign and has improved the situation there tremendously.

Actual measurements are periodically made of the amount of solid matter deposited and some of the measurements

6000 —2,582—

made in the residential section in the poorer districts of St. Louis seem to indicate that the deposit there is really heavier. I want to point out again that it is not the large manufacturing concerns nor the utilities nor major industry that are at the bottom of the trouble. If they were they would simply order them to stop it and they would have the financial ability to do so. The problem is a social one and involves the inability of the people, who make the most of the smoke, to do much about it.

There is another economic problem involved. We are practically forced, as a matter of plain, ordinary economics, to buy the coal in the district which is reasonably adjacent to the community, so that those people have a means of livelihood. The full solution to the thing has not yet been obtained but industry and commercial establishments are really doing their part this coming winter.

Q. Now, is the new station at Venice similarly to be equipped with this type of equipment? A. The precipitators for that station are already purchased and will be installed 6002
as soon as the building is up.

Q. And are you able to approximate the total investment, the total outlay required to pursue this program on the part of the Union Electric group? A. Well, when I stated that the Cahokia Plant would cost, possibly, $1,000,-000 that was a somewhat rough estimate because we do not

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know just how we are going to do it. I would say that if Ashley Street cost $60,000 and the new Venice Plant possibly $100,000, that the million dollar figure, including all 6003
of it, may be reasonably correct or it might be $1,100,000. It is in that order of magnitude.

Q. Now, turning, if you will, to the main transmission system of the Union Electric group, will you refer to Respondents' Exhibit Number 51 and state for us the principal lines constituting the main transmission system? A. We have, in presenting this exhibit previously, made brief reference to the main transmission lines which run from the Keokuk Plant to the St. Louis plants and also from the Osage Project to St. Louis. There are other lines shown

on this exhibit between the Cahokia Station and the Venice Station and between the Cahokia Station and Ashley Street and between Venice and Page Avenue sub-station.

I should like to give some information as to the character of this construction and may bring in in this discussion some one or two other lines that were not considered of major importance and may not, all of them, be shown on that exhibit, but probably most of them will be.

The system in St. Louis is made up of both overhead
6005 transmission lines at voltages of 33,000 volts, 66,000 volts, 110,000 volts and 132,000 or 138,000 volts. Those are used interchangeably and it really means that the sending voltage and the generating in the line is 138,000 volts and the re-

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ceiving voltage is closer to 132,000.

I should like to use the abbreviation "kv." for kilovolts, meaning 132 kilovolts or 132,000 volts.

We have described the various plants and made some reference to the interconnection of the line and the economies which occur thereby, and I may have to slightly repeat
6006 in some places here in order to completely describe this situation. I will try to avoid it so far as possible.

The main transmission system consists of the tie lines interconnecting the six main generating plants and comprises over 1,000 miles of 3-phase circuits including 628 circuit miles of 132 kv., 60-cycle, wood pole and steel tower lines—by "wood pole" I should explain that these are what is known as "H" frame construction, each tower consisting of two wood poles connected by a horizontal crossarm and carrying three wires in horizontal configuration—287 circuit

miles of 110 kv., 25-cycle tower lines; 15.8 circuit miles of 66 kv., 60-cycle underground cables; 9.6 circuit miles of 66 kv., 60-cycle steel tower lines; 10.9 circuit miles of 33 kv., 60-cycle underground cables; and 68.8 circuit miles of 13.2 kv., 25-cycle underground cables.

The Keokuk Station on the North, generating at 25 cycles, is connected with St. Louis by two 110 kv., 300,000 cm.—the abbreviation for circular mills—copper circuits, each 143 miles long, carried on double circuit steel towers and terminating at the Page Avenue sub-station where three 6008

20,000 kilowatt frequency converters interconnect the 25 and 60-cycle systems.

Q. And that line was placed in service in what year? A. 1912 to 1913. I believe it was completed the latter part of 1912. I have a reference to that. They really went in service in 1913 although it was being constructed all during the year 1912.

In addition to those frequency changes or converters there is, also, a group of connecting cables between this Page Avenue sub-station and the Ashley Street Plant which 6009
operates at 13,200 volts and is described more particularly in what we referred to later as the subtransmission system.

There is no specific definition of what constitutes a subtransmission system, but it means, in general, a larger quantity of lower voltage circuits than your main highest voltage lines.

The Ashley Street Plant, which has both 25 and 60-cycle generators, is connected, as stated, to Page Avenue by these 13,000 volt underground cables, eight of them, and the 60-

cycle portion of the Ashley Street Plant is connected with the Cahokia Plant through four 33,000 volt cables of large size. These cables are supplied by transformers at the Cahokia and Ashley Street ends.

The combined transmission capacity between Cahokia and Ashley is, roughly, 50,000 kilowatts, more or less. The reason these terms have to be somewhat approximate is that the varying temperatures make a difference in the rating and

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6011 one has to take into account, if you are speaking of minimum capacities, that you have to speak in terms of summer conditions. At other times the capacity is considerably larger.

The Osage Plant is connected to Page Avenue by two 138 kv. 60-cycle, single circuit lines. Now, these two lines are on separate structures and are not sufficiently far apart so that any trouble on one circuit would not affect the other. They are almost entirely on private right-of-way with the exception of certain parallels about 7 miles long on which we are on the edge of a railroad right-of-way. That, of course, is private right-of-way in the sense that we have easements, but
6012 I referred in the other case to the fact that the eased right-of-way strip is in the order of 250 feet wide for the other circuit.

Q. These structures each carry 250,000 cm.—I beg your pardon. A. These lines are 336,400 cm., aluminum cable, steel reinforced, ordinarily abbreviated as A. C. S. R. The circuits are 135.5 miles long, each, and are carried on structures which have been designed as a result of considerable special research work at the time.

Certain improvements in the knowledge of the transmission art have occurred in recent years and to take full ad-

vantage of this information we went through some actual tests to determine the most economical way to obtain a maximum insulating value which includes the wood, itself, at the

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most moderate cost. The circuits are designed for 50 per cent. overload over and above the minimum requirements of what is known as the National Safety Code.

The district in which we operate is considered to be what is known as the heavy-loading district, which means that we obtain certain specified sleet, ice and wind loads. **6014**

The design of those so-called Osage-Page Avenue lines conforms to the very latest information available. Actual flashover tests were run on these structures with lightning generators and the voltage at which lightning could flash the circuit over was reproduced in the laboratory. Roughly speaking, as I recall it, it takes in the neighborhood of 6,000,000 volts to flash the circuit on a sudden impulse. That includes the insulating value of the long insulator strength plus at least 8 feet of wood, which is in the circuit, before it can get to the ground.

I might bring out how that is accomplished. The over- **6015**
head ground wires, of which there are two, are carried on top of the poles, one on each pole, at a distance of some 6 or 8 feet above the arm, in addition to which the ground wires, themselves, are stretched tighter than the conductors and obtain additional clearance in the middle of the span so that in the middle of the span they are probably 15 feet above the conductors. The ground wire has to be connected to the earth and the ordinary procedure is to run it right down the pole. This eliminates the insulating value of the pole, itself.

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If you don't have some kind of a ground wire down the pole, the pole, itself, is likely to be shattered by lightning. The method we used was to connect the ground wire which goes from the overhead wire to ground at a distance of about 15 feet out on the ground wire, itself, using great precautions in the type of clamp being used and in the nature of the conductor carried to ground, this latter being a copper-weld steel wire and connected into a clamp in such a way that there could be no electrolytic action and the clamp connected
6017 to the overhead line with a hinge arrangement such that there should be no occasion for this wire to break due to the swinging of the overhead ground wire.

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That wire is then connected to the pole at a distance of about ten feet below the cross arm and from there on down it continues down the pole. The result is that any way the lightning tries to go from the conductor, either across the arm and up to the overhead wire or across the arm and down to the ground, it has to pass the combined installation of about 12 to 14 insulators and eight feet of wood.

6018 That wood is ordinarily good when dry for about 100,000 volts per foot for short-time step wave front lightning. The values under those conditions are only slightly different.

I want to make it clear that the porcelain insulators in this type of application serve to hold the operating voltage entirely. We do not depend in any way on the wood insulation for this but the wood insulation is largely depended upon for lightning. The results of this design have largely been a most attractive operating record, practically no failures. No load has ever been lost in the eight years, I believe, which is

the length of time that project has been operating. No load has ever been lost due to the operation of the transmission circuits.

Q. Have you stated the type of structure on which these circuits are carried? A. I have stated the construction for the Page Avenue lines only. I am now going over to describe the southern route which, on the exhibit, is from Osage to St. Louis by way of Rivermines in St. Francis County.

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Q. Before you get to that and while we are still on the 6020
Osage-Page Avenue line, have you stated the years in which those two circuits went into service? A. They were put in with the Osage plant. It ought to be 1931. That is correct. They were put in service in 1931, and the second one followed the first one after a short interval.

Q. The second circuit? A. The second circuit and actually it was not really designated as being in service until the following year, 1932. They were both under construction in the same general period.

(Discussion off the record.)

6021

By Mr. Hamilton:

Q. I think you might put that on the record. A. The Page Avenue wood structures are fully impregnated with a vacuum process and the crossarms which are about 31 or 32 feet long and made up of 2 x 12's bolted together back to back with large spacer blocks in between to form a rigid truss.

Those arms were treated at lower temperature and under special conditions to avoid damage to the timber. Tests

were made, both before and after treatment, to ascertain the result, it being generally understood by the trade that fir could not be impregnated without certain damage.

This work was done by ourselves in conjunction with Stone & Webster and with the advice of the Forest Products Laboratory, a Government research agency for timber products, located in Wisconsin. They issue bulletins as a result

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of the Government's research on timber.

6023 We took advantage of all the information available in their literature, what Stone & Webster had been unable to accumulate and what we, ourselves, had found, and we are certain that we succeeded in doing this job without damaging the wood.

That merely means that we will get longer life out of the pole line. We do not see why we should not get at least 35 years, minimum, and it is possible that with certain repairs we may go much longer than that, because there has been no experienced data really available on properly treated timber by modern processes.

6024 This treatment is toxic and the modern viewpoint is that rot is primarily a result of the eating of wood by various animal-type matter and that if the wood is poisoned it should last many, many years.

Q. Once installed, are these poles treated from time to time? A. No, the vacuum process takes the treatment clear into the heart wood, and there would be no possibility of treating them externally to do any good. I may say that so far the only things that have bothered that line at all are woodpeckers, and they have become discouraged after a few hours' work.

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(Discussion off the record.)

The Witness: The structures for the Page Avenue lines consist of long leaf, southeastern yellow pine

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with vacuum impregnation.

The crossarms have been mentioned, I believe, and are made of western fir.

By Mr. Hamilton: 6026

Q. You are referring now to the lines from Osage to Page Avenue? A. Yes, these are the same lines from Osage to Page Avenue.

The other circuits from Osage to Page Avenue are a little more original in their design. The circuits leading from Cahokia south, crossing the river at Crystal City, the Mississippi River, and from thence on to Rivermines, as shown on that exhibit, No. 51, are double circuit steel tower lines. It was felt that the extension from Rivermines on to Osage should continue this type of construction, but we desired to obtain, if possible, a higher level of insulation 6027 against lightning.

After comparing various types of construction and costs, we decided to build a steel structure designed for two 3-phase, 250,000 circular mill copper conductors arranged in vertical configuration on two sides of the tower but with a very large offset on the middle wire, it being supported about 15 feet out from the tower which will be explained.

Above the tower we have two overhead ground wires located as nearly over the conductors as is possible in a

practical design. These arms were all made free to swing.
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This idea of a swinging arm, itself, was not original with us, but was invented by the Bethlehem Steel Corporation, however, it had had no application in practice because there was no particular gain to be had from a long steel arm and the only reason for swinging arms with a hinge at the top would be to make the arm longer than ordinary.

I will explain that by stating that if the lightning merely
6029 has to flash over the insulator string to get to steel and thence to ground, there is no object in making the arm any longer than that same distance. On the other hand, if that arm could be made of insulating material which could be effective against lightning, then every foot you put in there will increase your lightning flash over value from 75 to 100,000 volt. The result was we decided to adopt wooden insulation in these arms, make them of a series of wooden trusses and make the middle arm about 15 feet long and the top and bottom arms somewhat shorter.

If this had been a rigid arm without the hinge at the
6030 tower, it would be economically impracticable to build a tower strong enough to withstand the breaking strength of three conductors at an average distance of 12 or 13 feet from the top.

Those conductors have a breaking strength of, I would assume, in the neighborhood of six to eight thousand pounds each, which would mean we would have to support a possible load of eighteen to twenty thousand pounds out at a distance of 12 to 15 feet, depending on whether you are
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talking about the middle wire or the top or bottom wire. Those are approximate figures.

(Discussion off the record.)

The Witness: These arms are subject to a possible fracture due to lightning. In other words, they can be split. As a result, the tension member, which holds the arm and keeps it from falling, is made of a duplicated design, either one of which will hold many thousands of pounds if the other one is broken. 6032

We have actually had one case in which the lightning struck this line, shattered one of the arms and did not even interrupt the service which was being carried on the line. That is, the distance over which the lightning had to flash was o great that it could not maintain ionization across the gap and the power arc did not follow on through. That is the only case of this kind with which I have ever had any experience, although I have heard since of one other case.

That is to say, we had a lightning flash over but 6033
the power arc did not follow and nobody knew anything about it, except that we had an oscillograph connected at Rivermines which operated and gave us an alarm. When we went out and examined the tower, we found that the lightning had evidently flashed all three wires on one side of the tower and without the service being disturbed on that same circuit.

Had that service been interfered with, the other circuit would have carried it as intended. The record

of that line is very attractive and I will go into that

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on a later chapter on operation, but it has fully met our expectations.

The reason those arms do not swing around, normally, is that the hinge at the tower is not a vertical hinge but is at an angle, and in order for that arm to swing around it has to lift the combined weight of itself and the span on either side, which is very
6035 heavy, consequently the vertical load of the span wires and of the arm itself keep it in its position, although it is free to move a certain amount.

The service obtained from this line is equivalent to that so far obtained from the other circuits, no load having been lost by either one, although a double circuit tower line of any construction, whatsoever, is subject to some types of disturbance which might not get both structures in single circuit lines.

It has been our experience, however, that the only thing which bothers a tower of this type is a tornado
6036 and unless the single circuit lines are widely separated, it could conceivably get both of them, as well.

St. Louis is in a tornado district and there are records of quite a number. We have had experience with two disastrous ones. We made an analysis of the transmission line right-of-way leading to the southwest from St. Louis for some considerable distance, although it was never built, and one reason it was not built was because we found a record of 42

tornadoes that had gone longitudinally along this

—2,596—

route and, instead of taking the line out crosswise, they might have taken it out lengthwise and that was one of the discouraging features.

However, that proposed line was intended to connect to a dam which was contemplated on the White River and was never built.

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By Mr. Hamilton:

Q. Now, will you particularize about these lines somewhat more, and begin, if you will, with the section of line running from Cahokia to Crystal City, and will you state when that section was placed in service and give information comparable to that given for the other line? A. The section of the line from Cahokia to Crystal City was constructed earlier and I know the date, but I want to verify it, 1925. Now, that line was constructed for the specific purpose at the time of supplying what we would call our Jefferson County division, it being the county immediately adjacent to 6039 St. Louis County on the south, and primarily at the same time to supply the plant of the Pittsburgh Plate Glass Company, a very large industry which has one of the largest plants at that point.

The problem of crossing the Mississippi River with an overhead line was an undertaking of some magnitude and had many engineering difficulties. At that time a 138,000 volt cable was not practicable. Since then there have been some installations, but it would have been impossible at that

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time and we did not want to go into a cable circuit, anyhow, for other reasons.

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The situation at this river crossing was that of a span of almost a mile, some 4,800 feet leading from a high bluff to a flat valley land on the other side, and with a requirement of high clearance over the river. Due to the ice and load conditions, it probably can be stated as having to support six wires and an overhead ground wire at a height on one
6041 side of the river of 300 feet approximately and be able to sustain a breaking load of 60,000 pounds per conductor, so it became quite a problem.

As a matter of fact, we spent $125,000 on the foundation before we got out of the ground for that one tower and the total crossing ran in the order of $180,000-some. We had many things to overcome and decide.

In those days the X-ray method of determining whether metal had any flaws in it was not available. That is a recent development in the last three or four years.

Q. What is the sag in that span? A. I cannot state that
6042 exactly, but I think we are required to maintain 90-some feet above the river and the maximum point is about 300, so it sags down very rapidly.

It is carried over the top of the suspension tower on the Illinois side of the river and balanced over that tower and carried on again into the next span until you get below the low point at which point it is anchored.

Each of these conductors is a very large cable and they are made up of what is known as bridge sockets on the end, just the same as the method by which a suspension bridge is

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carried and requires hoisting with a hoist or single wire up to the tower and it took the combined efforts of two boats to drag this single wire across the river against the high wind that came up at the time.

We had the additional problem that this windstorm continued and we were unable to get a man up to the tower. No one could climb the tower against that wind, and we had to let the line lie in the river all night, although that was a fundamental rule for the job, that that conductor must never be allowed to rest in the sand. We could not help it. 6044

The next day we underran the conductor with a pulley and boat to go across and got it out without damage and were successful in getting it up on that tower.

Altogether it was a rather difficult project. We made every part in duplicate and broke one part in a testing machine and assumed that the other one was equal, because the stresses were right at the limit of the best material we could get.

At the time, I believe it was the longest span in the world and I believe it still is. I know it is longer than the St. Lawrence River span which failed, and also longer than the Car- 6045
quines River span. It was straight and had one lock span on it. These are the three longest in America. I do not know anything about the European record.

(Discussion off the record.)

—2,599—

Q. Now, Mr. Stokes, state if you will the length of line from Cahokia to Crystal City and its voltage? A. Cahokia to Crystal City is about 20-some odd miles. If you take it clear through to Crystal City it is 30.84, and that conductor in there is 300,000 cm., A. C. S. R.

6046 *Stanley Stokes—By Respondents—Direct*

Q. And how many circuits are there on that line? A. There are two circuits on this transmission line, and they continue from Crystal City on to Rivermines.

Q. Before we get on to that continuation, the voltage if you will of the line from Cahokia to Crystal City? A. 138,000 volts.

Q. And that line is of steel-tower construction? A. It is, a steel-tower line with the conductors, as stated, operating at 138,000 volts at the sending end. This is one continuous
6047 circuit as far as voltage is concerned, that is it runs right straight from Osage, by Rivermines at which point there is a switching station, on by Crystal City at which point it is tapped for local service and the glass company located there, on up to Cahokia. But the line itself was constructed at different intervals, and has a different grade of construction at each section.

Q. Now comparable information, if you will, for the portion of the line running from Crystal City to Rivermines? A. That line was constructed just shortly before the Osage project was put in. It was put in service in 1930. It is a

6048 —2,600—

little heavier steel-tower construction than the section between Cahokia and Crystal City, but otherwise, rather similar.

It has 4/0 copper conductor, 211,000 cm. This particular conductor used was seven strand. An ordinary conductor is usually 19 strand. This was a slight economy in this seven-strand conductor, and it was a little more rugged. The length of that circuit is 27.6 miles, and that brings us to Rivermines.

Q. Now the voltage of that line is what? A. That is 138,000 volts. All of these circuits are connected to each other.

Q. And how many circuits are carried? A. Two.

Q. And the construction is again a steel tower, is it not? A. Yes, a little heavier, as I said, than the Crystal City line.

The distance from Rivermines to Osage I do not believe
has been put in the record. It is 119½ miles, and it is the
power line which was under extensive discussion here with
the steel tower, swinging wood arm construction. The con- 6050
ductor there was rated 250,000 cm.

Q. And the voltage? A. 138 kv.

Q. And the number of circuits? A. A double circuit, steel tower line.

Now, I don't believe that I have quite completed what I

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meant to bring out. There were one or two other circuits that I should have included in a little more detail.

I have particular reference to the transmission line be-
tween Cahokia and Venice. This is a very short line, only
4.81 miles in length, operating at 66,000 volts, 60 cycles, and 6051
is a double circuit steel tower with 350,000 cm. copper con-
ductors. It is a very heavy type line, and was constructed
under rather difficult conditions. There were many obstacles.
The average height of this line is about 170 feet to the bottom
wire. That had to cross two or three bridges, go over some
river structures, and then some of the tower foundations had
to be designed for river current, under high water condi-
tions. Its application is very important because it is the
main tie line between the Cahokia and Venice plants.

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The insulation of that line is adequate for somewhat higher voltage, and the factor of safety is very good. The operation of that circuit has been very satisfactory.

Q. And that line was placed in service in what year? A. That was placed in service in 1927.

Q. Now, there appear on Exhibit No. 51 certain other transmission lines which I don't believe you have described in detail, one line is a line running from Venice to Alton. Will you give comparable information as to that? A. The
6053 Venice-Alton circuits extend northward from our Venice plant to a town known as Alton, Illinois, a distance of 16.56

—2,602—

miles and consists of a double circuit steel tower line operating at 66,000 volts. It was originally constructed with 3/0 A. C. S. R. conductors. The load grew so heavily, due to some large industrials in that district, as well as the normal growth, that we had contemplated building another circuit.

Calculations were made, and showed that the factor of safety in the line as designed was fully adequate for 4/0 cop-
6054 per conductors, whose diameter is practically the same as 3/0 A. C. S. R., and which did not change the wind loading on the line. The vertical weight of the 4/0 conductor was not of any consequence in the design, and the breaking strength was only slightly higher than the original conductor.

The result of all of these calculations was that we recently completed, within the last two months, changing the conductor on those circuits from aluminum of moderate size to the larger sized copper, and by that means were able to add 15 or 20,000 kilowatts of available transmission capacity in

that district at a cost much lower than the construction of a new circuit.

Furthermore, the available right-of-way in that district is practically limited to one more circuit, and it is important to us to get the most power we can out of the present two circuits before we use up that last available space. It is becoming very difficult to get a line in there.

Q. And the line is presently of what size? A. It is pres-

ently 4/0 copper, having recently been changed. 6056

I do not have to refer to notes particularly on these lines, because I had charge of the design and construction of the Cahokia-Crystal City line, the Venice-Alton line; I cooperated in the design of the Crystal City-Rivermines line, and controlled the design of the Rivermines-Osage lines, although the construction of those lines was done by the contract. So that part of the transmission system is one with which I am very familiar.

Q. Now that line to which you have just referred is a steel-tower construction line, is it not? A. It is.

Q. And it was installed in what year? A. The Venice-Alton line was installed in 1927. I gave the length and the year. We have two other circuits leading east from Cahokia, which terminate at a town known as Belleville, Illinois. Our ownership of those circuits extends to a town called Centerville. They carry a rather heavy load and consist of double-circuit steel-tower construction, very similar to the Alton line just described. They are operated at 66,000 volts. The length of the line included in our property account is only $4\frac{1}{2}$ miles. They have two circuits of 4/0 A. C. S. R. 6057

Q. And the line to which you have just referred is shown on the map, is it, as running from Cahokia to a point designated on Exhibit 51 as "B-4"? A. That is correct. That

—2,604—

happens to be the limit of our certificate of convenience and necessity for distribution at that point, and it goes on into the territory of the adjacent company.

We have fairly completely described now, as a summary, the Osage-Page circuits, which were two separate single circuit lines; the Osage-Rivermines, which was a double circuit,
6059 steel tower, swinging arm line; the Rivermines-Crystal City, which is a double circuit, steel tower line, and the Cahokia-Crystal City line which is also a double circuit steel tower line.

—2,605—

That takes us around the circuit of the Osage lines. We have also described the Venice-Alton lines, and the Cahokia-Centerville lines.

We also mentioned and described the short line between Cahokia and Venice, which was the heavy tie circuit between
6060 plants, a double-circuit, 66 kv. steel tower line.

This leaves us with perhaps a little more detail to be added on the 25-cycle Keokuk circuits. Those have been mentioned several times, but the detail of construction has not been fully covered at any one place, although I believe it has been pretty fairly covered as a whole.

Q. All right, very briefly, if you will. A. I would like to summarize it, if I may, in order to get it into the record in one place.

The Keokuk-St. Louis line, placed in service in 1913, consists of a double-circuit, 110,000-volt, 25-cycle transmis-

 6061

sion line, approximately 143 miles long, with 300,000 cm. copper conductor, connecting Keokuk and St. Louis.

At a point called Meppen on this line, there is a sub-station, and the voltage is stepped down from 110,000 volts to 66,000 volts, and carried to Alton by means of the Alton-Meppen circuit. This was constructed in 1914, it is 28.7 miles in length, has one circuit, steel tower construction, and 2/0 copper conductor.

That circuit extends from Meppen, as shown on Exhibit
51, over to Alton, and thence on to the Lake Avenue sub- 6062

—2,606—

station in East St. Louis.

Q. The terminus, I take it, of the line from Alton to Meppen, is the point shown on Exhibit No. 51 by the symbol C-8? A. Yes. The other terminus of it, after it passes Alton and goes on to East St. Louis, is Lake Avenue, which is shown as a square representing a sub-station, and the letter "B" indicating ownership by the Union Electric Company of Illinois.

This Keokuk line was put in at the early date of 1913, 6063
and was at that time the highest voltage transmission line, I believe, anywhere in the Middle West. Central Colorado had a line of that voltage, and I believe there were some in the South. At any rate, the insulators and all of the various features of the line were rather new and experimental. We will describe later the fact that we cooperated to some extent in the design of those insulators, or our predecessor company did, and they were known as the Keokuk insulators. Over 50 per cent. of those are still in regular service today, and have proved very satisfactory after all of these years.

6064

There is another interesting application on that line known as the Nicholson arc suppressor. This device, which I believe has been largely discontinued on 60-cycle circuits, has functioned very satisfactorily over many years on the

—2,607—

25-cycle system, and the service rendered by this Keokuk line has been remarkably good.

One reason for that is this, that the length of time in which the 25-cycle oscillation passes through zero of the
6065 current wave, and by that I mean if you alternate a current 25 times a second, you take a longer period in passing through the zero part of the wave than you do if you have an oscillation 60 times a second. And that difference is just enough that, with long lines, it is very frequent that if there is a flash-over due to lightning, that the arc goes out at the first zero part of the wave, and the service is not interrupted, and the only way we know that it existed is because we have certain recorders mounted along the line.

The question was raised repeatedly as to why that Keokuk line gave better service than some other circuits which we
6066 thought were better constructed, and the solution turned out to be that it was because it was operated at 25 cycles, it had certain peculiar characteristics. This Nicholson arc suppressor is a device on the roof of the power station at Keokuk, which, when a ground goes on the circuit, due to lightning or any other difficulty, it operates a contactor, shorts that particular wire to ground, and immediately blows a fuse. This fuse is something on the order of 10 or 12 feet long, and this structure on the roof is a circular device about 15 or 20 feet high and 10 feet in diameter, and has a series

—2,608—

of these big fuse tubes, arranged in a circle, and it rotates and a new one comes into position. The purpose of the thing is that on the application of a sudden ground, if you can suddenly short the line ahead of that ground, the arc will go out, and then you remove the ground through your fuse.

Well, sir, the operation of that device has been such that we have kept it in service all these years, and still intend to do so. It is not considered a modern device, but on that particular system it has demonstrated that it is very effective. 6068

The recording device to which I have referred was rather novel. We have overhead ground wires on that circuit, and the lightning usually strikes them, and we arranged an ammeter device connected in the lead that carries the overhead wire to ground, and it records any current flowing down that lead. With that, we can tell where the lightning stroke was, and if there is any trouble, the patrolman can tell immediately, by looking at these ammeter charts, what section to go to. It is such a long line that if you can save delay it is worth while. There is usually no interruption of service whatever due to the loss of one of the Keokuk circuits, and 6069
we have supplied all service with the loss of both of them.

We had a tornado some years ago and it took out about a half a mile of the Keokuk line, along with other buildings and threes, and the service was interrupted for a very short

—2,609—

duration, and we picked up the load at our end, and they picked up the Keokuk load at the other end, and the disturbance to the system load was minor, although the line was taken away entirely.

That repair was made under flood conditions when the river was up 10 miles on one side out of its banks, and altogether it was quite a difficult repair job.

But the facilities available, which prevented that thing from being a real disaster, were all that saved the day. We have had other experiences with tornados.

Now the Page-Venice circuits, or Venice-Page circuits, either way (we usually refer to them as the Venice-Page circuits), consist of two 66,000-volt underground cables, carried
6071 as submarine cables from the Venice plant until we get across the river on the Missouri side, and thence through conduit to the Page Avenue sub-station.

Cables of this voltage, and particularly of large capacity, these being 750,000 cm., copper, represent a real cable problem. First, the static head that exists from the time you leave the power plant on the level of the ground behind the levee, until you get down to the bottom of the river, is some 40 or 50 feet, minimum, and that much pressure on a cable causes the oil to migrate. These cables have oil in them. It also puts some stresses on the lead sheet—all of which have
6072 to be carefully anticipated and taken care of by various means.

—2,610—

The pot-head problem at the terminal of this submarine cable is rather a severe engineering problem, although it has been solved all right. I wouldn't say we have had perfect service with those cables, because there have been mechanical damages. We don't know in all cases what did it, whether it was a bolt or what, but two of them have been mechanically damaged, and have had to be replaced. I should say those

are single-conductor cables. All of our other cable system is three-conductor cable, in which all three conductors are separately insulated and enclosed within an insulating layer, and placed within one lead sheet. These are single, and it takes six of them to make up the two circuits.

The land section has some problems in the manholes, where you have to make joints, to be sure that the oil reservoirs and all of the equipment that goes with it are properly done by the man who does the work, together with the fact that they must be at all times free from moisture. Hot oil 6074
has to be poured over these joints all the while they are made, so that no moisture from the atmosphere can get into them. Finally, we get to Page Avenue, where these cables terminate in two transformer banks, one for each circuit, 50,000 kilowatts each, and these banks are equipped with load ratio control equipment, which permits the voltage to be adjusted automatically, or at the discretion of the operator.

This adjustment of voltage at the two ends of these cable

—2,611—

systems, and again at Rivermines, Missouri, and again at 6075
Cahokia, and in our new plant at Venice, permits us to do what is equivalent to tilting the rating on these lines in either direction. If you could think of my having a little trough of water, if I wanted the water to flow that way, I would tilt it this way (indicating), and if I wanted to have it flow this way (indicating), I would tilt it that way (indicating).

Now in that case you can control the flow of kilowatts by the governors on your steam turbines, but the flow of the kilovars, or reactive energy, is determined by voltage conditions, and if you want to control that flow you must have

control of the voltage, and if you want to reverse the flow of power over a circuit of a magnitude of that character, with an ordinary circuit without load ratio control, there would be a voltage drop from the transmitting end to the receiving end. Then, if you start at the receiving end, the voltage taps now having been set lower here than they are here, (indicating), you might start out at Osage, for example, with 141,000 volts, and deliver at Page Avenue 132,000. Then you would start at Page Avenue and go back,
6077 you would start at 132 and wind up at Osage at something like 120.

Now that problem exists throughout any power system where power has to have a reversible flow, and in order to make the system work successfully, and not be limited to a lot of problems that you can't control, this load ratio

—2,612—

control equipment is used at a number of points.

Those Venice-Page circuits have given us very reliable service, and they are very important in our system, because they do connect our major steam plants with both of our
6078 hydro plants.

Q. Now the length of that line is what? A. That is about 7 miles. The exact length is 7.94 miles.

Q. And the year in which the line was placed in service? A. 1930 it was placed in service.

I think I have now described what I would consider to be the more important high voltage circuits. We have many other circuits which are of great importance, operating at lower voltages, and certain of those will be described under what I would call our sub-transmission system.

Q. Now you have given us a number of figures on the size of the conductors, variously from 250,000 cm. on up to as high as 750,000 cm. Now, will you translate that in simple terms to indicate whether those conductors are of considerable size or whether they are small, or whatever nature they may be? A. We regard all of those circuits as being what are known as heavy-powered circuits, and can express the idea by saying that any of them can transmit from 50,000 kilowatts up, at will. Even with these cable 6080

circuits which we rate at 50,000 kilowatts for continuous operation, we wouldn't hesitate to put 100,000 kilowatts on them for a few minutes.

For example, we actually operate the Venice-Page cables at 50,000 kilowatts per circuit whenever we want to. If one of those were to trip out, the other circuit picks up the full load, whatever it may be, whether it is 75,000 or 100,000, for the length of time required for the Osage plant to come in and take the load.

So that the Osage-Page circuits are limited, not by the current-carrying capacity of the conductors—those conductors which were listed as 336,400 A. C. S. R. are equivalent to a 4/0 copper in carrying capacity, aluminum having about 60 per cent. of the conductivity of copper—but the limit on the Osage-Page circuits is what is known as a stability limit, and is a measure of the amount of synchronizing power or torque, if you like to look at it in that way, that you can transmit over a transmission line. 6081

Those problems do not arise until you get some length in the circuit. To illustrate the thing as simply as I can,

if you regard a slender steel shaft as being twisted from each end, there will come a time at which it will break, and in the electric parlance, the breaking point is when the machine at the sending end pulls out of step with the generator at the receiving end. Previous to that, they are running in synchronism, each one keeping together with the other, and

—2,614—

you get a sudden short-circuit somewhere, and one machine may plough right ahead, and pull out of phase with the other
6083 one.

Before you reach that limit you will have to be sure that you either keep your load down or provide sufficient high-speed switching that you can clear the circuit quickly and rely on your others, the stability limits being a function of the speed with which you can clear the circuit after trouble starts.

The Examiner: Let us have a short recess.

(Whereupon, a short recess was taken, after which the hearing was resumed.)

6084 The Examiner: Let us proceed.

The Witness: Although we have completed the description of the Osage-Rivermines transmission circuits, I would like to mention that the type of structure being original, and the length of the line being considerable, and the importance of the job rather great, it became necessary for us to do a considerable amount of research work, involving laboratory testing, the design of clamps to hold wood, and calculations with regard to the probable loads on the wires, and

 6085

many other factors. So that, altogether, it represented quite a little development work.

By Mr. Hamilton:

Q. Is bulk power tapped off the main transmission line

—2,615—

at various points? A. Yes. If you refer to bulk power as meaning a sort of a wholesale point at which power is sold or delivered in a large quantity at one point, we do tap this Keokuk-St. Louis line at Hull sub-station, which is shown 6086
on Exhibit 51 at the point marked Hull, shown as a red square with a "C" alongside of it, and the terminus there is shown as "C-6". That is opposite the town of Hannibal, on the Missouri side. At this point there is a step-down sub-station and circuits are originated, one of which comes over across the Mississippi River to a point marked "C-5", —anyway, that is Ilasco, the end of that short extension, at which location there is a large cement mill. That circuit supplies that, and also supplies a neighboring utility at that point.

That was covered in the testimony previously given. 6087

The capacity of that station is largely required, however, for the Central Illinois Public Service Company, most of whose load lies 15 or 20 miles north at the town of Quincy, which is also shown on the map.

I would like to give some capacity figures for the size of that sub-station, if I may. I may not have it readily available, although I have it in some of my notes.

Q. I think we can get that later. A. I will get that a little later. I think it is approximately 34,000 kilowatts.

—2,616—

6088 *Stanley Stokes—By Respondents—Direct*

The line from Keokuk to St. Louis is also tapped at Meppen, and that was mentioned under our transmission discussion. I think the capacity of these various stations will be brought out better under the discussion of sub-stations than under the transmission system itself; although at our Page Avenue sub-station we have some very important transformer banks, and they were listed in total, and while some of them have been mentioned individually, I do not believe that we have summarized the groups as a whole.

6089 I would like to get those figures in, because I consider the Page Avenue sub-station to be a transmission station rather than an ordinary distribution station.

We have at that location: two 110/13.2 kv., 37,500 k. v. a., 25-cycle transformer banks. The terminology is the same for the rest of them.

Two 132/13.8, 56,250 k. v. a., 60-cycle transformer banks.

Two 66/13.8 kv., 56,250 k. v. a., 60-cycle transformer banks.

Three 33/13.8 kv., 13,333 k. v. a., 60-cycle transformers.

One 33/13.8 kv., 12,000 k. v. a., 60-cycle transformer.

6090 Three 33/13.8 kv., 10,000 k. v. a., 60-cycle transformers.

Three 13.8/4.5 kv., 7,500 k. v. a., 60-cycle transformers.

The point of interest there is that the Osage circuits, which come into Page Avenue, are stepped down from 132,000 volts as delivered to the 13.8 hundred volt bus, and then stepped up again to 66 kv. for delivery to the cables that go

—2,617—

to the Venice plant. The reason for that is this, that there is no common utilization voltage at Page Avenue, no one voltage that you could select that would do the job, because you have the various requirements.

Consequently, we selected the bus voltage at the plant as being the most suitable for switching, just exactly like a power plant selects its bus voltage and transforms everything to that.

Various other methods were considered, and that was decided on as the best.

Now at the Cahokia plant, the transformer equipment in the yard adjacent to the building consists of two 132/66 kv., and two 66/13.8 kv. transformer banks, the first pair being 56,250 k. v. a., and the last pair 62,500 k. v. a. Those are 6092
large transformers. They connect Cahokia north onto the transmission circuits going to Venice, and south and west onto the transmission circuits going to Crystal City, Rivermines and Osage.

Q. Now is the transmission system so designed that bulk supply centers on the system may be fed from two directions? A. The general design of our system uses more duplicated circuits and less loop circuits than many companies. Loop circuits are usually cheaper in some ways, but at the time of trouble, the trouble is actually on the same circuit on which

—2,618— 6093

you are trying to deliver the load until you get it opened. That is, a loop circuit clears upon opening an oil switch at some place, and the remaining part of the loop carries the load. If those two circuits were not connected at all, one would not be involved in the trouble on the other. The performance is about identical if the switches work all right. If there is any failure on the switching equipment, the two separate circuits give a little better grade of service. We have no objection to either one, but all of these bulk or large,

important centers are supplied with duplicate service, whether obtained by loop methods or by independent circuits.

Our system generates its own power, and we buy, I think, no power from other sources.

Q. Are the overhead transmission lines designed to withstand ice strain and high winds? A. Yes, we are located in what is classified as a heavy loading area, and we design our circuits to withstand the customary ice and wind loading conditions of what is known as a Class B loading system, one-
6095 half inch of ice and an 8-pound wind at the same time. Then, for our important circuits, we allow a 50 per cent. overload above those figures. There is a very weak spot in the specifications in the National Safety Code with respect to the design of steel tower transmission lines, and it has to do with the fact that there is little, if anything, said about the number of broken conductors for which you should design. —2,619—

Now the chief strain on a tower occurs at a time of a broken conductor. So that if we were to design a tower for Class B loading and no broken conductors, we would have a
6096 relatively light design. If, on the other hand, I were to design it for three broken conductors in one circuit, I would have about the heaviest design that could be used on a straight line or tangent tower. Our practice is to design an anchor tower or a dead end for all broken conductors on one side of the tower. By "one side", I mean looking in one direction down the line. That is the worst possible condition that you can put on a dead end tower. Also, designs for one broken conductor in one circuit of a tangent tower, and two broken conductors or the equivalent, for an angle tower. All

of these designs contemplate the use of a 50 per cent. overload factor of safety.

The Safety Code merely requires that you meet those conditions. In other words that you are about ready to fail.

I believe that general standard of construction is today adhered to by a good many of the large city companies. It is not usually adhered to by some of the smaller groups. I mean by that, that we design a high grade line, but I am willing to admit that other people do very much the same thing today. That statement should be limited now to what would be re- 6098
garded as first class metropolitan cities.

Q. Now, are the lines also designed to minimize lightning troubles? A. Yes, I have treated with that to some extent

—2,620—

in connection with the design of the wood cross-arm Rivermines line which was actually tested in a lightning generator laboratory, full scale. The lightning outages have been negligible on those circuits, and from this description you will observe that we have a large number of circuit miles exposed and that the likelihood of trouble is proportionate
to the number of miles of line, and that a long line, to give 6099
good service, has to be more carefully constructed than a short one.

The various means of designing a line to withstand lightning, all sum up in one way or another to obtain adequate clearance from your conductor to ground through the air, and by "ground" I mean either a grounded steel tower or a ground wire down a pole, or any other structure, combined with insulating materials which will more than withstand the voltage required to arc from the conducter to that ground.

In other words, for example, if you had a three foot clearance to steel in the normal position of the wire, which used to be a very ordinary design, considered good, you first would have to have insulators of one kind or another, either a combination of wood and porcelain, or all porcelain, which would not flash over at that value, because you do not want the arc going over your insulator string. If you want to get a better performance than that, you want to increase that clearance and use more insulators. That is what we have
6101 done in all of our circuits. We either have a very large

—2,621—

clearance, and a combination of wood, or an equivalent large string of insulators.

That is not altogether true on our earlier lines, although they are duplicated and short, and give very good service.

The improvement in the method of building transmission lines dates from what is known as cathode-ray oscillograph, which provides information as to what the lightning stroke really does, and the improvement in the operation
6102 of these lines is to a large extent affected on our system by the use of the type of oscillograph which is built in the form of a little automatic device, and located at three or four of our strategic points. Those instruments are expensive, about three or four thousand dollars apiece.

Q. Is the main transmission system adequate for present loading and for presently anticipated loads? A. Yes, it has considerable leeway in the matter of capacity. We might illustrate that by the loadings that occur on the transformer banks themselves at times of peak loads.

A transmission line is nothing but a piece of wire, and if the distance is moderately short, not over 50 miles or something like that, you could keep on running the load up on that until it gets hot, and it wouldn't really fail on you until you have passed the annealing limit of the copper, and that point would be a load clear above the economic or practical voltage drop and energy loss limits. Hence, no

—2,622—

transformer bank is ever installed for that high rating on the wire, and the limits of these transmission lines are the 6104 practical voltage drops in the line, and the limiting capacity is always determined by the transformers.

In this particular example which I would like to give, I can illustrate the system peak which occurred at December 12, 1939, and amounted to 476,000 kilowatts, and show how it was distributed on different banks of transformers, and determine what percentage of their capacity was being used.

The Page transformers, supplying the Page-Osage line, have a load of 41,000 kilowatts or 43,700 k. v. a., with an installed capacity of 112,500, and was operating at 38.8 per 6105 cent. of its capacity at the time of the peak. Similarly, the Page-Venice transformer at Page had a load of 12,100, 14,300 k. v. a., and a capacity of 112,500, and was carrying 12.7 per cent. of its rating.

The Page-Keokuk transformer at Page had a load of 9,000 kilowatts, a k. v. a. of 9,500, and an installed capacity of 75,000 and was running at 12.7 per cent. of its rating.

Now that is due to the winter load conditions in the hydro plant, that is not the season of the year in which that

transformer would be carrying the largest load. At some other time, it would be loaded more than 12.7 per cent.

Rivermines transformers have 24,000 kilowatts, with 31,000 k. v. a., and installed capacity of 60,000, and was running at 51.6 per cent. of capacity. —2,623—

Q. I don't think you need to detail the load on each particular transformer. Will you indicate the range? A. That illustrates the method used, and I will give the range
6107 by saying that the maximum load on any bank came on the Cahokia main sub-station transformer, which had a watt load of 110,000, a k. v. a. load of 110,000—that power factor by the way would be corrected to unity at the time—and had a capacity of 125,000, and was operating at 88 per cent. of its rating.

So the range there, the highest load was 88 per cent., down to a normal loading there of about 35 to 23 per cent., in that range. Those two extremely low loadings there were due to the fact that that is a hydro transmission circuit, and this particular date was during the light load period. I
6108 think I could generalize and say that we could readjust loads there and safely carry 50 per cent. or more load above that which we had at the time.

Q. Now would you state whether the addition of the new units at Venice have any effect on the adequacy of the transmission line, or whether they will have? A. Well, we will have to buy new transformers for the Venice plant, but the transmission lines will be adequate. We will have to provide some additional feeder circuits at 33,000 volts, but the main high voltage transmission circuits will still have ample capacity. —2,624—

Q. Will you state what you regard as being the contributions to the transmission art which have been made by the Union Electric Group in the development of its main transmission system? A. Well, a little at a time, throughout this testimony, I have mentioned some of the features which we have developed, among which was the swinging arm wood transmission line. I mentioned briefly the Mississippi River crossing which was an improvement in that particular type of work in many ways over anything that had been done.

The insulators for Keokuk, for the Keokuk lines, were 6110
a special development. We can't personally take any credit for that, because that occurred prior to the time that we really owned that property, but we now own it and those same insulators are still giving service. That work was done with our knowledge, because we were interested in the type of service we were going to get over that circuit even then, but we had a contract to receive the power from the Keokuk company. That was the Mississippi River Power Company which is now a subsidiary of the Union Electric Company of Missouri.

We have installed a very complete communications sys- 6111
tem, and it largely consists of carrier current telephony on these transmission lines, and some original work was done by us on it in the early development of that particular type of communication. The majority of that development work was carried on by the other parts of the North American System.

—2,625—

We built an experimental line which operated between St. Louis and St. Charles, Missouri, and transmitted information over this so-called carrier current back in the early days of its development. That was purely experimental, however,

6112 and was not continued in service. Our present equipment is built by the regular suppliers of that type of equipment, but installed by ourselves, and due to our familiarity with the requirements of carrier current communication, the successful operation of the equipment has been much above average.

For example, we can talk successfully from Keokuk to Page Avenue, 143 miles, on from Page Avenue, on another circuit, having stepped down from the first one and coupled up to the second one, on to Osage—another 138 miles, and
6113 from there on to Rivermines, another 120 or 125 miles, and carry on a satisfactory conversation throughout that entire length. That is not essentially normally in regular operations, because most of the communication is between the various plants and the city load dispatcher, but as a matter of information we can talk the other way readily.

The developments of the St. Louis group are rather considerable in the cable part of the system, but the large amount of that work is done at the lower, 33,000 volts, and will be discussed under our general system of sub-transmission cables. —2,626—

6114 There is one other feature that has contributed a great deal to the successful operation of our circuits, and that was the extension of the use of the wood insulation in the poles and cross arms to that of guy insulators. It was found that a great deal of the trouble on transmission circuits, as well as distribution circuits, came about by reason of lightning flashing from one of the conductors to the guy that was holding the pole, and by inserting a long eight or ten foot wood strain insulator, we were able to improve the operation of those circuits.

 6115

One feature of transmission design which has not in the past been practiced, but which we carried out carefully on the Osage circuits, was the exact measurement of ground resistance for each power before any ground wires or other connecting devices were applied, and if any tower or pole did not come up to a predetermined low value, additional ground rods or other precautions were taken to insure low ground resistance. It had not been appreciated in earlier years, the importance that low ground resistance on a trans-
mission line really amounted to. What we found out was 6116
that with a heavy stroke of ligthning which conceivably can readily reach 100,000 amperes down a tower for a few millionths of a second, that that can cause the whole tower to rise up above ground potential. I will explain that with an example. Suppose we have what is very frequently a good value of 10 ohms ground resistance, in other words between the tower itself and ultimate earth potential, which may

—2,627—

be many feet in the ground, an equivalent value of 10 ohms exists.

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100,000 amperes, flowing down through 10 ohms would produce a million-volt drop, and that drop would cause the tower, the earth being at zero potential for example, would cause the tower to suddenly assume a potential 1,000,000 volts above ground for that fraction of a second.

Under those conditions, the conductors which have quite a bit of electrostatic capacity to ground would remain fixed relatively with respect to ground, and the tower would flash to the conductors—and that turned out to be the explanation of a large percentage of the double-circuit faults in which

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they really held the conductors at practically even potential because of their condenser effect to ground, and suddenly shot the tower up for just an instant and it went over to the conductors and that naturally would affect them both.

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Well, all of those things represent just added information with respect to the art, and what we try to do is to apply them as quickly as we can do so to get results.

6119 The operation of all of those circuits I have mentioned, particularly the Osage-Page, and the Osage-Rivermines, have a record which is very good, indeed.

Q. Is this testing conducted in your own laboratory? A. No, that is conducted in a regular professional testing laboratory, where they have these machines for pulling wires, and so forth. We do not ourselves own that kind of a laboratory. There are three such laboratories, regular commercial laboratories, available in St. Louis for ordinary commercial testing. They were primarily installed for such things as buildings, and concrete design, and testing of things like that, but they
6120 are equally applicable to what we want to do. We could also make those tests in any one of the university laboratories which are available to us as well. We wouldn't have enough continuous testing to justify the investment in a major testing laboratory of that kind. The mechanical people who design buildings and things like that, really have more occasion for these laboratories, they are always testing concrete or something else. So they have found it feasible for several of these commercial firms to operate a laboratory for that purpose.

We do our own work in this testing, utilizing the facili-

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ties of this commercial laboratory.

Q. I believe you spoke of a lightning generator in connection with a description of the testing. What is that? A. Well, that is a device to produce artificial lightning on a relatively large scale. Anyone who saw the General Electric exhibit at the World's Fair has really seen the largest one so far built.

It is a series of condensers or capacitors, which can be 6122
charged at moderate voltage from a vacuum tube generator, in parallel. Think of a lot of small units, in order to keep them from flashing over to ground later, and they spiral them up like a spiral stairway, and if you can think of an insulated spiral stairway with a great big block of capacity sitting on each step, and if you had means of charging those devices from a vacuum tube generator in parallel, and then by a trick circuit, discharge them in series,—voltages build up and add directly in series, currents add in parallel. For example, if you had a thousand of those condensers and each one was good for 10,000 volts, then you would have to have 6123
a 10,000-volt charging generator which could put current into all of them in parallel. Then when you discharge them through a gap, and a peculiar circuit which is too complicated to go into here, but rather ingenious, all these condensers discharge in series, and the voltage builds up the product of the number of condensers times their individual voltage. In the example I used, that would be 1,000 times 10,000, or

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10,000,000 volts, which is about what that World's Fair generator is.

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This particular test we made was made in the Westinghouse laboratories, but there are two such generators available, and these smaller manufacturers now have smaller ones for lower voltage testing. They are very effective to determine what happens if lightning strikes a tower. They have gotten them up to pretty good capacity. They can take a stroke of lightning, maybe 15 or 20 feet long, from one of those generators, and strike a block of wood a foot square and 6 feet long, and shatter it into a hundred pieces, and it
6125 will fly all over the room, just with one stroke.

That sort of thing was of no value until the cathode ray oscillograph was available to measure the voltage actually obtained, and then out on a transmission system, various devices have been installed on the towers to get an idea of how much current flows down those towers, little magnetic elements that are either magnetized or demagnetized by lightning, and you get a relative idea from those as to what the currents were, going down the tower; and knowing the value of your ground impedance, or resistance, which you can measure, you determine to a certain extent the probable
6126 voltage of the lightning, and that, then, is duplicated in the lightning generator in the laboratory.

The interesting thing about our particular swinging-arm

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towers on this test was that the calculated value of flashover, including a combination of insulators and a certain amount of wood, came out as we had predicted. We were rather surprised and pleased that it did, but the voltage drop across an insulator string, and across a piece of wood, do not add up directly.

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If I had a 1,000-volt drop across an insulator, and a 1,000-volt drop across a wooden arm, my total would not be 2,000, and knowing something about that, we had made allowances for that, and the results of the test were about as expected, and the flash took place from the conductor across to a point on the arm about 5 feet from the tower, which is about where we predicted it should.

Q. So that in perfecting the transmission line design, you conduct laboratory experiments to simulate conditions to which the line itself will actually be exposed in operation? 6128
A. That is right.

Q. Do you actually construct your transmission lines yourself, and by "you", I mean the Union Electric Group? A. We do it both ways. We constructed the Alton lines ourselves, the Cahokia-Centerville lines, the Cahokia-Crystal City lines; and because of the Osage project, and having Stone & Webster engaged on it, these other lines were constructed by them, I mean the Osage circuits, although we carried out the design jointly with them. The actual construction was carried on by contract.

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Q. How about the crossing of the river at Crystal City? A. We did that work ourselves.

Mr. Hamilton: This represents a good breaking point, Mr. Examiner.

The Examiner: All right, we will recess until 10 o'clock tomorrow morning.

(Whereupon, at 4:30 o'clock p. m., a recess was taken until 10 o'clock a. m., Wednesday, October 23, 1940.)

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